DECEMBER, 1955

B 566901

PIPE LINE INDUSTRY

Gulf Publishing Company

CONSTRUCTION • OPERATIONS • MAINTENANCE

New Coating

A new asphalt mastic weight coating with high corrosion resistance shows bright promise for use on underwater pipe lines

Page 20

Downhill Job

A section of the towering Palisades on the west bank of the Hudson River above New York was just another hill for the pipeliners who put down TGT's new line into New York City . . . . . Page 28

Supercompressibility

A term that is seldom understood, yet is of the utmost importance in high-pressure gas measurement. In this issue is a simple manner in which to apply it. . . . . Page 33

Turn page for additional contents and a Quick Review of this issue

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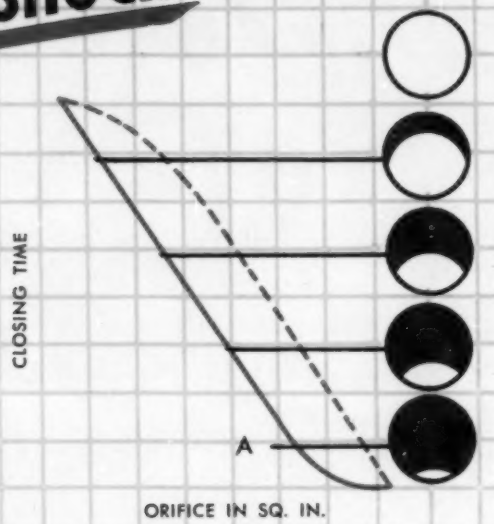
W-K-M Eclipse Closing . . . takes the SHOCK out of Line Surge



Dotted line shows closing curve of conventional gate valve.

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MOST OF THE WORLD'S NEWEST PIPELINES ARE TIED TOGETHER WITH W-K-M VALVES

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PIPE LINE INDUSTRY

CONTENTS and Quick Review

December, 1955 Vol. 3, No. 6

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

New Coating Shows Promise for Offshore Pipe Lines

☐ A new asphalt mastic weight coating with high corrosion resistance has been developed for underwater pipe lines. The coating weighs up to 240 pounds per cubic foot and it can be applied joint-by-joint as the pipe is fed into the water. It looks promising for offshore pipe lines.....Page 20

The Salesman and the Buyer

☐ There are certain standards by which salesmen and buyers judge each other. Each has his own problems which can only be overcome or made easier when one undersands the other. Here is an article that is frank evaluation of such problems by a salesman and a buyer speaking from opposite sides of the desk. Read what they have to say.

By W. F. Logue and L. W. Hubbell.....Pages 24-25

How 8 Million Pounds of Pipe Was Lowered Down a 150-Foot Cliff

☐ The Palisades on the west bank of the Hudson River provide an impressive sight for sightseers from New York City's West Side. But a group of pipeliners faced with the task of pulling two 24-inch pipe lines across the busy river must have taken a dim view of such beauty. An experienced construction team solved the problem to complete Tennessee Gas Transmission Company's new line serving the New York area.

By Harrison T. Brundage.....Page 28

Supercompressibility Made *Simple*

☐ Supercompressibility is a term seldom understood, yet it is of the utmost importance in high-pressure gas measurement. Here is a simple way to apply it. This is a must for every pipe line engineer's notebook.

By D. H. Lindsey.....Page 33

Shell's 'Lapline'

☐ Shell Oil Company's "Lapline" is now in operation, carrying up to 100,000 barrels of crude oil daily from Lake Maracaibo's wells to the loading terminal at Palmerejo. The submarine portion of the system is 18.5 miles long in water ranging up to 75 feet deep. Page 37

35 Miles of Line Cleaned and Coated in Place in One Operation

☐ The longest line ever coated internally in place is a 35-mile stretch of 8-inch and 10-inch pipe line in West Texas. The line was cleaned and coated internally with epoxy resin. Radioactive cobalt inserted in the coating pig enabled operators to exercise precise control over the operation.....Page 40

How to Improve Operation of Pressure Gages

☐ Although a comparatively simple instrument, the pressure gage is vital to the accurate measurement of gas. A few rules for proper installation, calibration, and maintenance will result in greater accuracy and improved operation throughout the life of the instrument.

By Oliver L. Clay.....Page 42

How to Control Piping System Pulsations

☐ It is difficult to predict the extent magnitude of pulsations in gas piping systems before a station goes into operation. But the problems can be minimized through the diligent use of the dynamic relationships in the design of compressor plant piping and pulsation dampening equipment. This article offers a summary of pulsation dampening engineering today.

By N. H. Moerke and C. Newman.....Page 44

Engineer Paint System for Better Results

☐ The pipe line industry can save hundreds of thousands of dollars each year through the proper design of paint systems at the various plants, says the author of this article.

By Warren D. Palmer.....Page 50

Methods of Displacing Liquid Hydrocarbons

☐ Here is a review of some of the basic methods used to displace liquid hydrocarbons from pipe lines. Some of the various reasons for displacing lines are outlined. Included is a look at some of the advantages and disadvantages of the various methods and some factors which might influence the selection of a specific method.

By S. C. Phelps.....Page 56

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Propane Air System Serves Town When Line Fails.....Page 23

United Gas' Turbine Station Gets Its First Major Checkup.....Page 46

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PIPE LINE INDUSTRY published every month. Entered as second class mail matter July 9, 1954, at the post office at Houston, Texas, under the act of March 3, 1879.

Unfavorable Publicity Points Out Needs

Too much unfavorable publicity continues to plague the oil industry. Several examples appeared in San Francisco newspapers during the American Petroleum Institute annual meeting last month.

One newspaper story stated oil men attending the API resulted in the largest and most expensive collection of privately owned airplanes in the history of California. Another story was about the largest cocktail party ever given in California, costing $27,000. Still another newspaper story said more mink coats than ever assembled at one place were worn by the wives of oil men attending a ladies style show.

•

This is the kind of publicity that does irreplaceable damage to the industry. It is such publicity that causes the public to look upon every oil man as rolling in far more money than he needs.

This is the kind of publicity that makes it so difficult for the industry to get a receptive response from the public and members of Congress when it talks about natural gas price regulation, depletion allowance needs, higher prices, and other matters. Such publicity makes it difficult for the industry's public relations efforts to accomplish better results.

It will be a long time before a great many of the general public in California forget these stories. Until this occurs the oil industry will not be held in favorable repute by the public in this area.

•

It will do no good for the industry to point a finger at the San Francisco newspapers and accuse them of being unfavorable to the industry. From a strict newspaper viewpoint, these stories made interesting reading for the general public. Therefore, they were good newspaper reporting.

The trouble with these stories is that they failed to present a complete picture. They did not explain that 5400 men—exclusive of perhaps as many as 1800 wives—were participating in the API activities. Nor did they explain that the influx of at least 6000 out-of-town men and women taxed all transportation facilities, that each private plane carried a full passenger load, and that only a relatively small part actually came by privately owned planes.

Nor did the stories explain that several thousands attended the publicized cocktail-buffet dinner party, and the cost per head was not out of line with many previous California parties. Observation would also reveal that the majority of oil wives did not have mink coats. The very large attendance of wives (1780) had much to do with the number of mink coats in evidence.

•

The industry needs to come to more fully realize, however, that such publicity does it a great deal of damage.

The publicity in San Francisco newspapers may point out the need for the industry to look more closely at some of its actions, and to guard against things which might tend to create such unfavorable publicity.

Perhaps, more of the industry's planes might have been dispersed at different airports in the area without attracting so much attention. Some thought might be given to the advisability of removing identifying names from the planes.

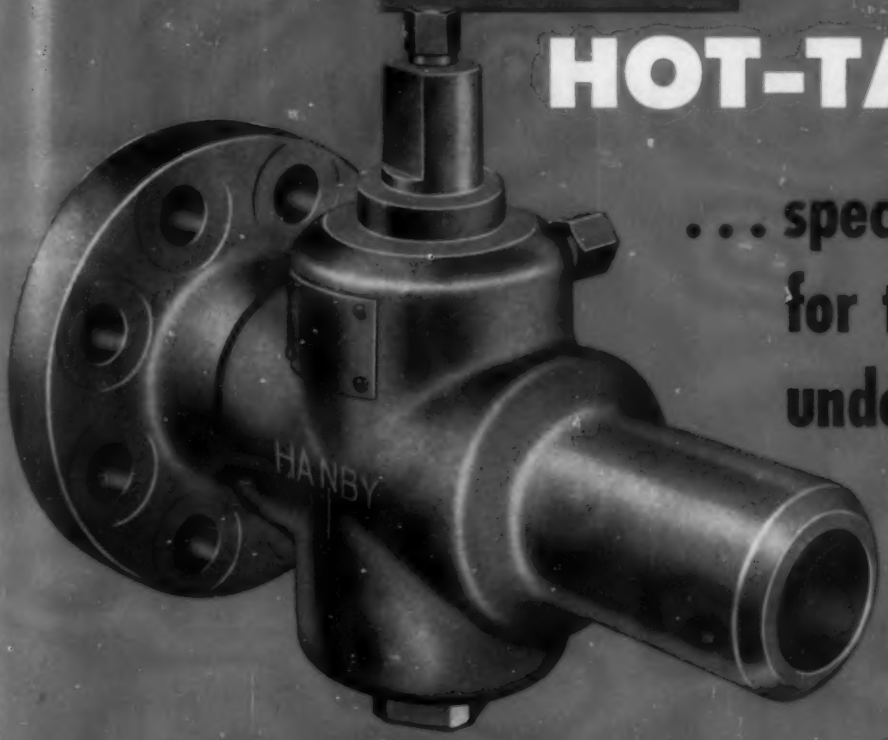
The number of cocktail parties given at the annual API meeting has increased sharply in recent years. Perhaps, too many large cocktail parties are being given. A number of oil company officials have been heard to express this opinion.

Perhaps, the industry should be careful about holding such a large meeting as the annual API convention outside of Chicago, where it attracts far less attention.

But above all, every one in the oil business should set about to do his share in avoiding actions that might bring such unfavorable publicity to the industry.

Warren L. Baker

This NEW HANBY HOT-TAP VALVE



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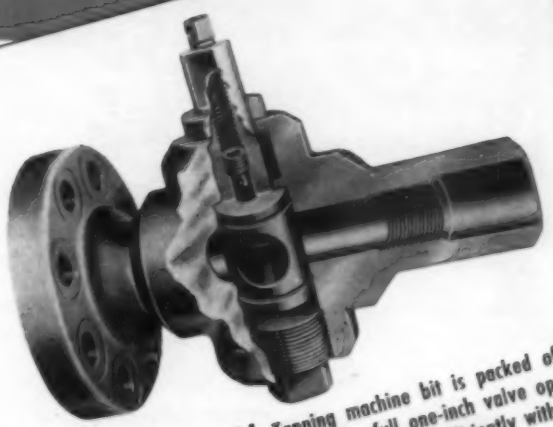

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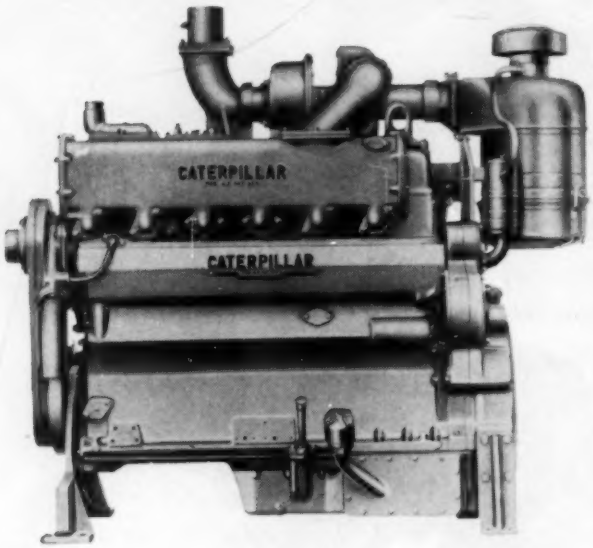

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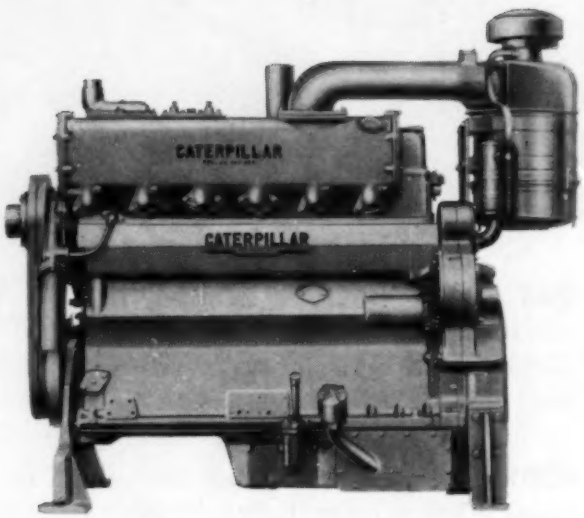

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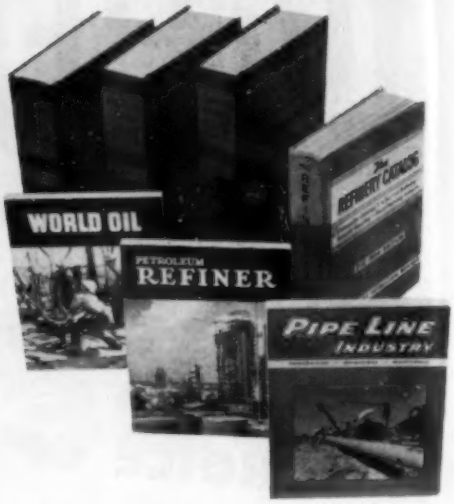
PIPE LINE INDUSTRY



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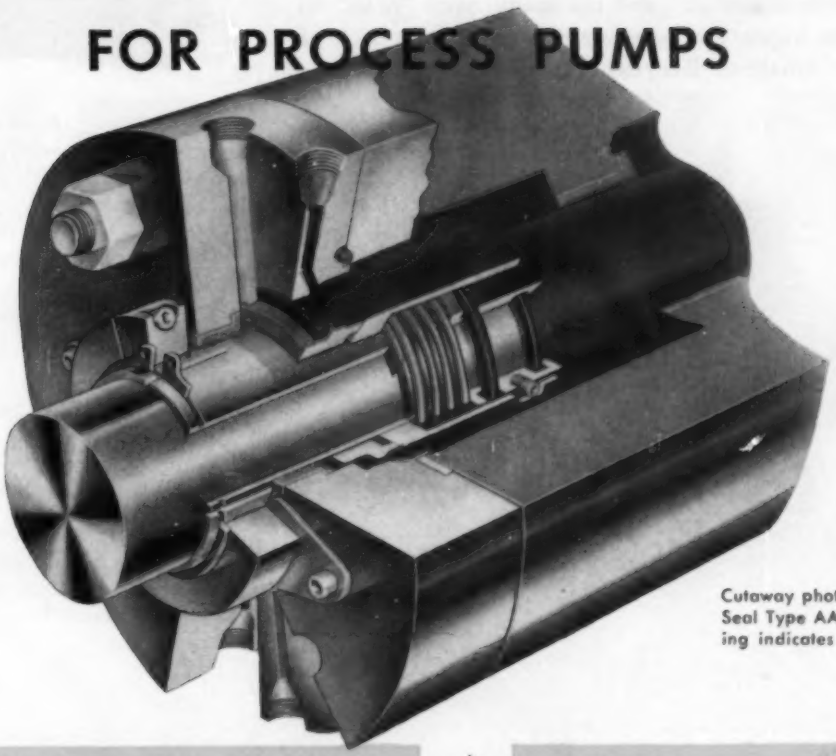

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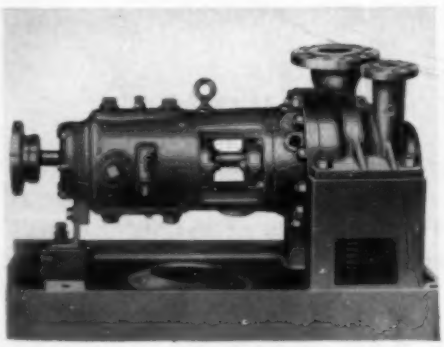

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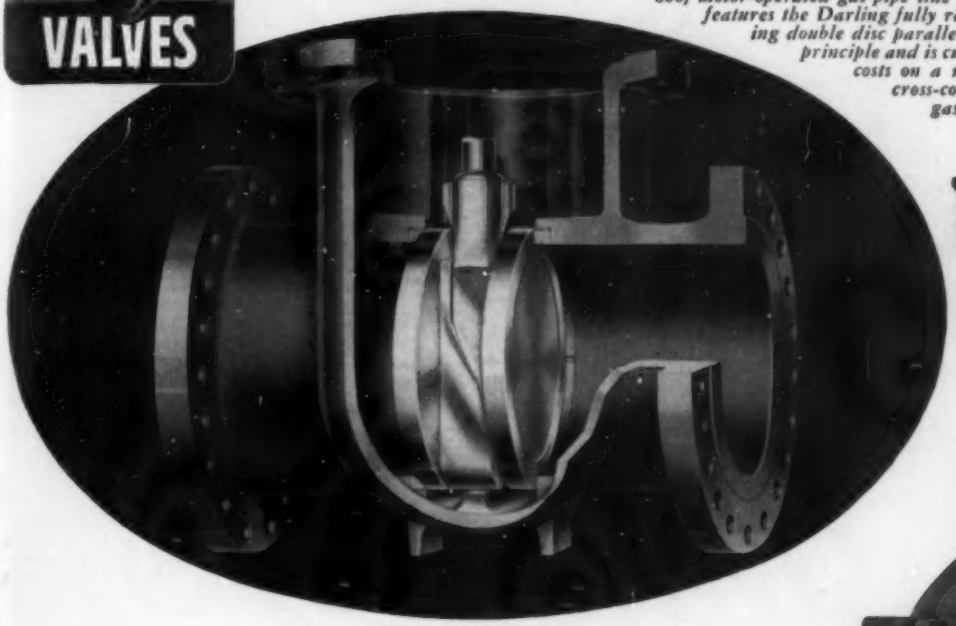

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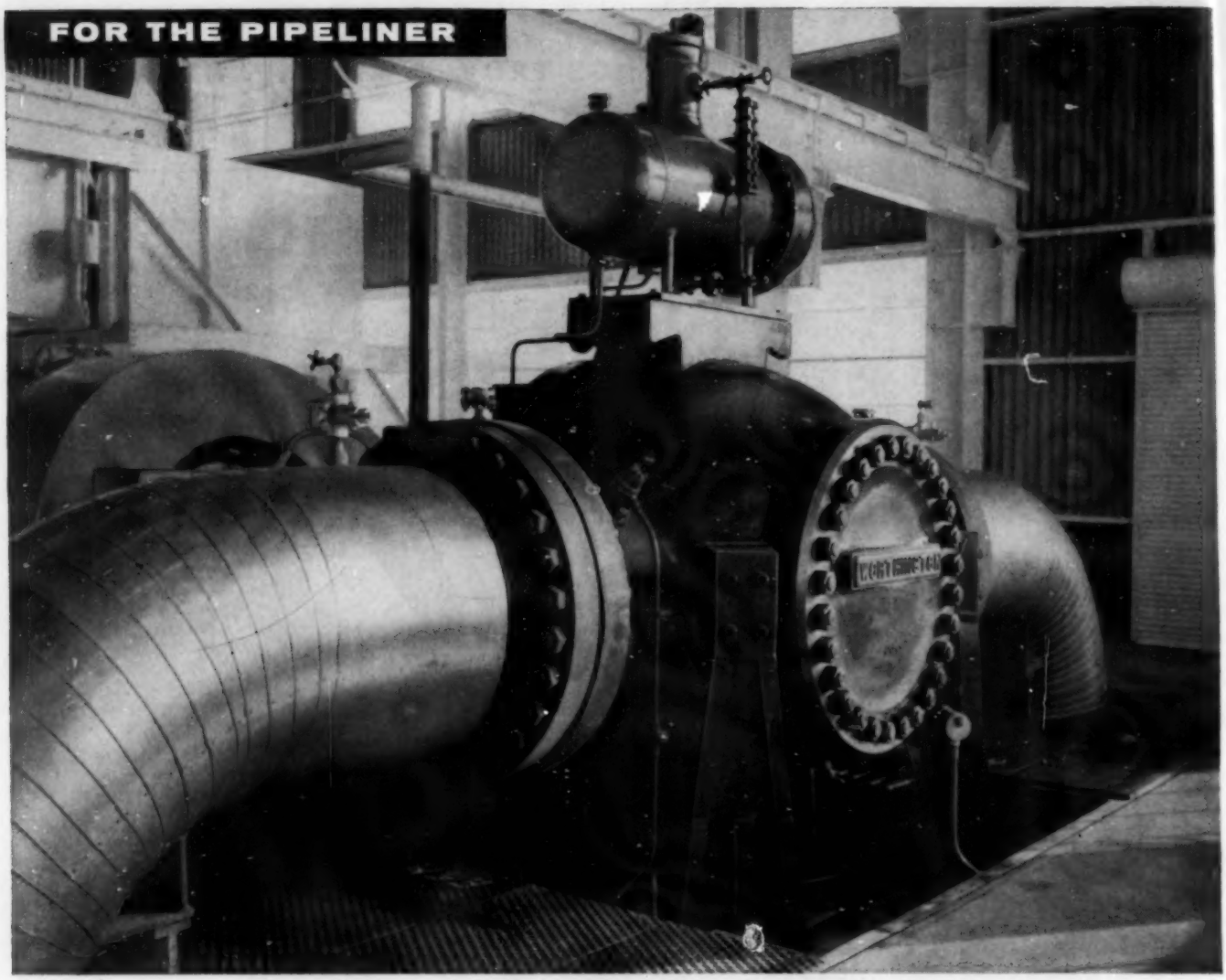

WORTHINGTON GUP CENTRIFUGAL COMPRESSOR installed in Northern Natural Gas Company's Compressor Station at Macksville, Kansas.

New design concept combats shaft distortion, seal-oil leakage in new centrifugal compressor

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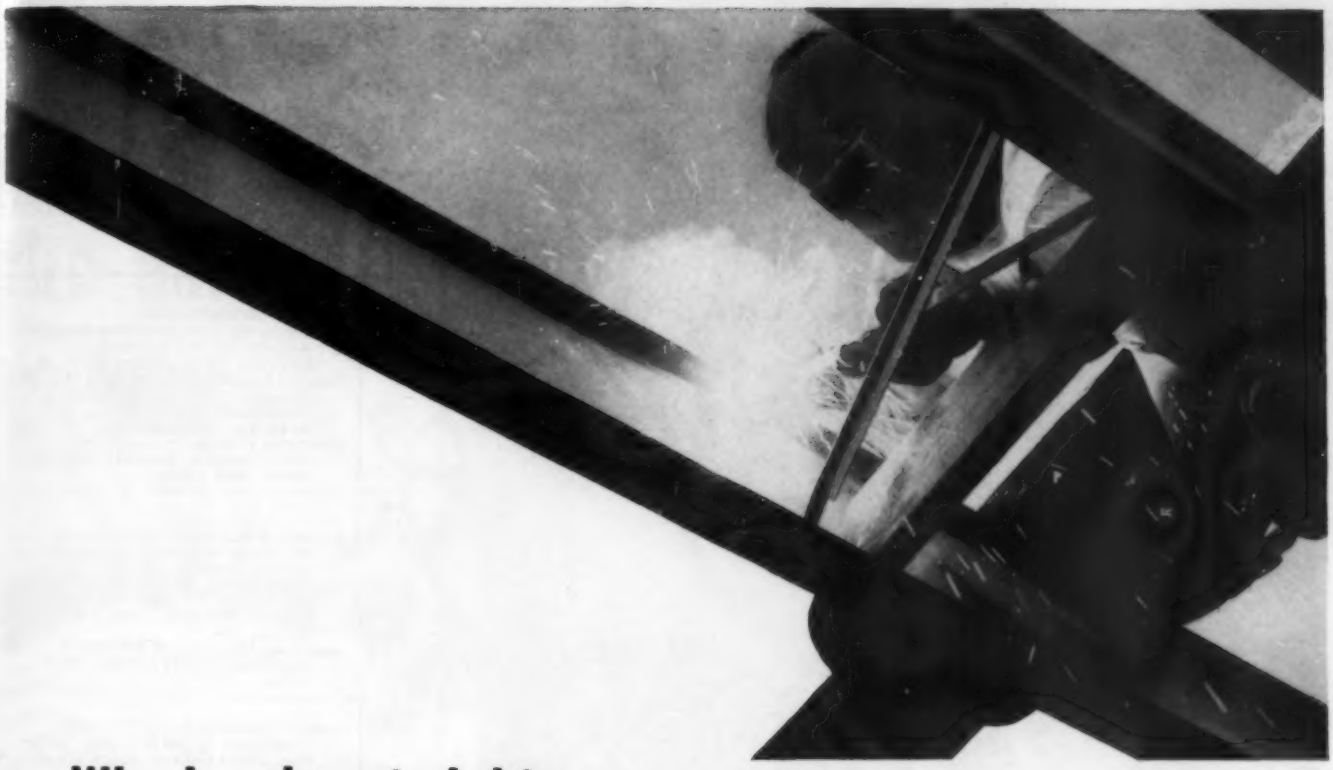

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EXTRAORDINARY MANEUVERABILITY enables the "240" to start trench right at the wellhead and do a fast clean job of cutting sharp turns and zig-zags frequently required in gathering lines trenching. This Cleveland is a rugged dependable performer on all kinds of pipeline jobs, large and small.

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WHO'S MEETING WHERE

DEC. 1– 3	Interstate Oil Compact Commission, Annual Winter Meeting, LaFonda Hotel, Santa Fe, N.M.
2	Natural Gasoline Association of America, Panhandle-Plains Meeting, Herring Hotel, Amarillo, Texas.
8– 9	American Petroleum Institute, OIIC Meeting, Waldorf-Astoria Hotel, New York.
1956 JAN. 9–13	Society of Automotive Engineers, Sheraton-Cadillac and Statler Hotels, Detroit.
16–18	Pipe Line Contractors Association, 8th Annual Convention, Boca Raton Hotel and Club, Boca Raton, Fla.
30– Feb. 3	American Institute of Electrical Engineers, Hotel Statler, New York.
FEB. 15–17	National Association of Corrosion Engineers, Tulsa Section, Corrosion Short Course, Mayo Hotel, Tulsa.
19–23	American Institute of Mining and Metallurgical Engineers, Hotel Statler, New York.
MAR. 12–16	National Association of Corrosion Engineers, Hotel Statler, New York.
19–21	Mid-West Gas Association, Hotel Fontenelle, Omaha, Nebr.
22–23	New England Gas Association, Annual Meeting, Hotel Statler, Boston.
APRIL 3– 5	Corrosion Control Short Course, The University of Oklahoma, Norman, Okla.
17–19	Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.
19–20	Indiana Gas Association, French Lick Springs Hotel, French Lick, Ind.
23–25	Southern Gas Association, Annual Convention, Dallas.
MAY 10–11	AGA Gas Supply, Transmission and Storage Conference, Conrad Hilton Hotel, Chicago.
22–24	Pennsylvania Gas Association, Pocono Manor Inn, Pocono Manor, Penn.

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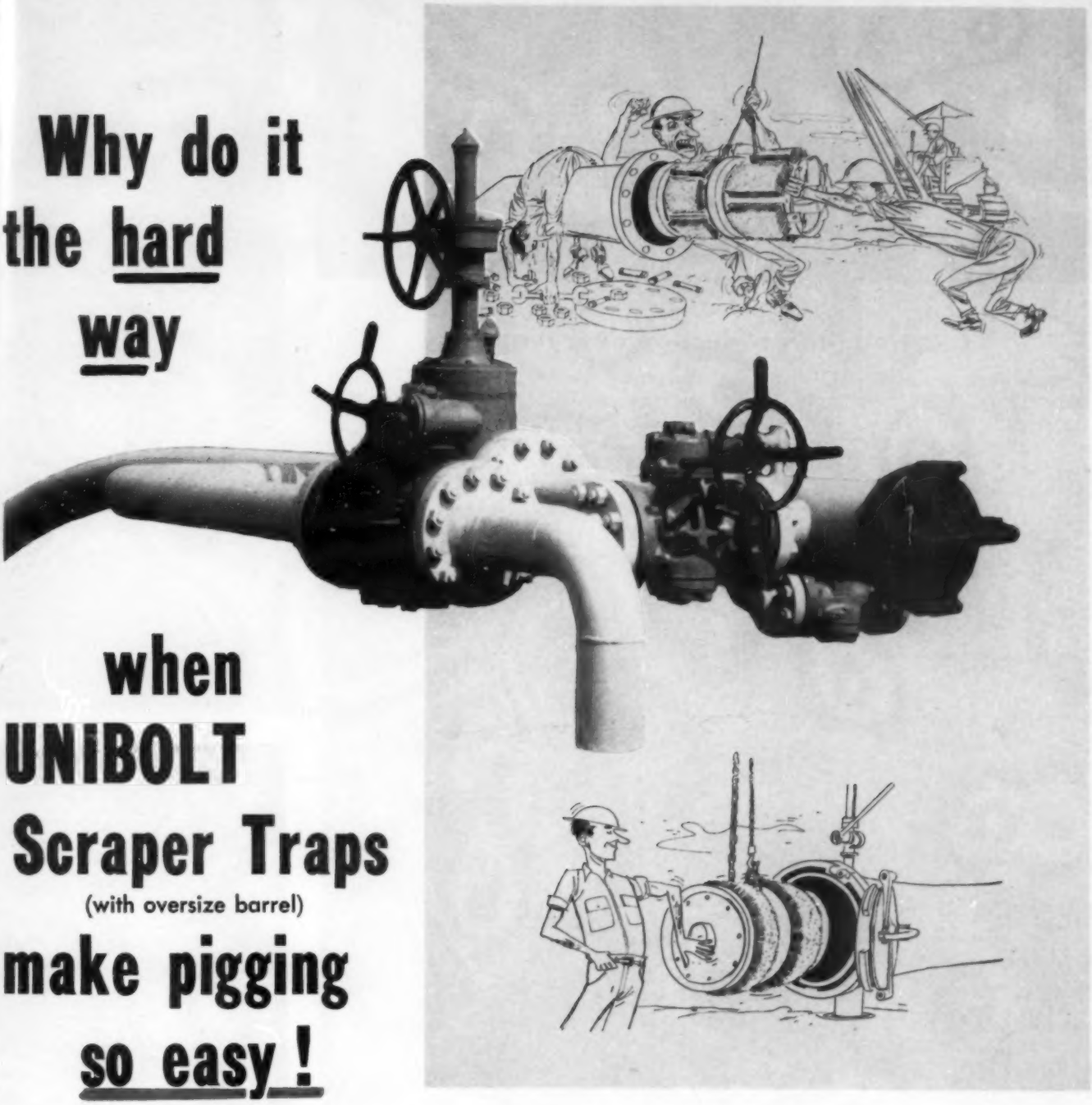
Why do it the hard way



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(with oversize barrel)

make pigging so easy!

Unibolt Scraper Trap Closures are the most convenient, most practical means for blanking off a line so that pigs may be easily inserted and removed from the trap. The scraper barrel being slightly larger than the pipe itself, the pig is easily inserted or removed. It is no longer necessary to "fight" the pig in and out of the trap. Release two bolts and the blanking plug swings open on a sturdy hinge. Swing the trap shut, tighten the bolts, and that's all. Let the pumps do the hard work. No heavy blind flanges to lift on or off. No multiple bolts to release and make up. Nothing to fall on the workmen. No leaky threads. An oil-resistant gasket seals automatically . . . seldom needs replacing.

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A PICTURE REPORT OF

INTERNATIONAL POWER *in action!*

Boosting job production everywhere

6 years, no overhauls—TD-14 with Superior Pipe-Boom, rear right, was bought by Luther Harper, Turley, Oklahoma pipe-layer, in 1949. In 10,000 hours since then, it has needed no major overhauls. TD-14, with Superior Boom, foreground, newest of Harper's 6 International crawlers, was bought for this job—laying 3½ miles of 12-inch gas line in East Tulsa. Last year, Mr. Harper's 6-unit IH fleet put in or removed 160 miles of pipe, some 24 inches in diameter.

56 miles in 6 weeks is the record of Irby Construction Company's fleet of TD-14's with International-Superior Booms on the job shown—taking up a 12¾-inch pipeline near Shreveport, Louisiana. Ample steady lifting power, plus all-gear drive on boom helped speed the job. Removal was handled by TD-14 boom-lifting pipe while another TD-14 pulled set of rollers below it. Ground was broken by a third International TD-14 working ahead. Pipe later was broken up and sold for scrap iron.

Fast pipe-cleaner—For cleaning pipe before being cut for salvage, Irby Constr. Co. uses this International-powered cleaner. Put between two TD-14's with Superior Booms, unit quickly cleans pipe as tractors go down line.

16,500 ft. per day—This TD-14A is helping lay 150 miles of 6, 8, and 10-inch natural gas line from Phenix City to Dothan to Enterprise, Alabama. Pipelayers, Engineering Construction Co. of Tulsa, with two spreads of International-Superior Pipe-Boom and other tractors, averages 16,500 ft. per 9-hour shift.

Welds 55 mi. gas line—Two 40-volt welding on TD-14 provide power for stringing , Seneca, West Virginia, to Woodstock, Virginia. Pipeline Construction & Drilling Company, Camp Hill, Pennsylvania, weld 2,500 feet daily with this rig.

Clears 50-ft. right-of-way—Clearing on same job described left is being done by TD-24 shown, plus 2 TD-18's and 2 TD-9's. Despite rough, rocky, mountainous terrain and 4500-ft. altitude, fleet clears an average of ½ mile per day.

"Best for backfilling" says R. M. Paylor, Pipeline Construction & Drilling Co. foreman, of International Drott TD-9. "It has highest reach and best balance of any equal-size loader. Hydro-spring sure saves wear in rough rock work."

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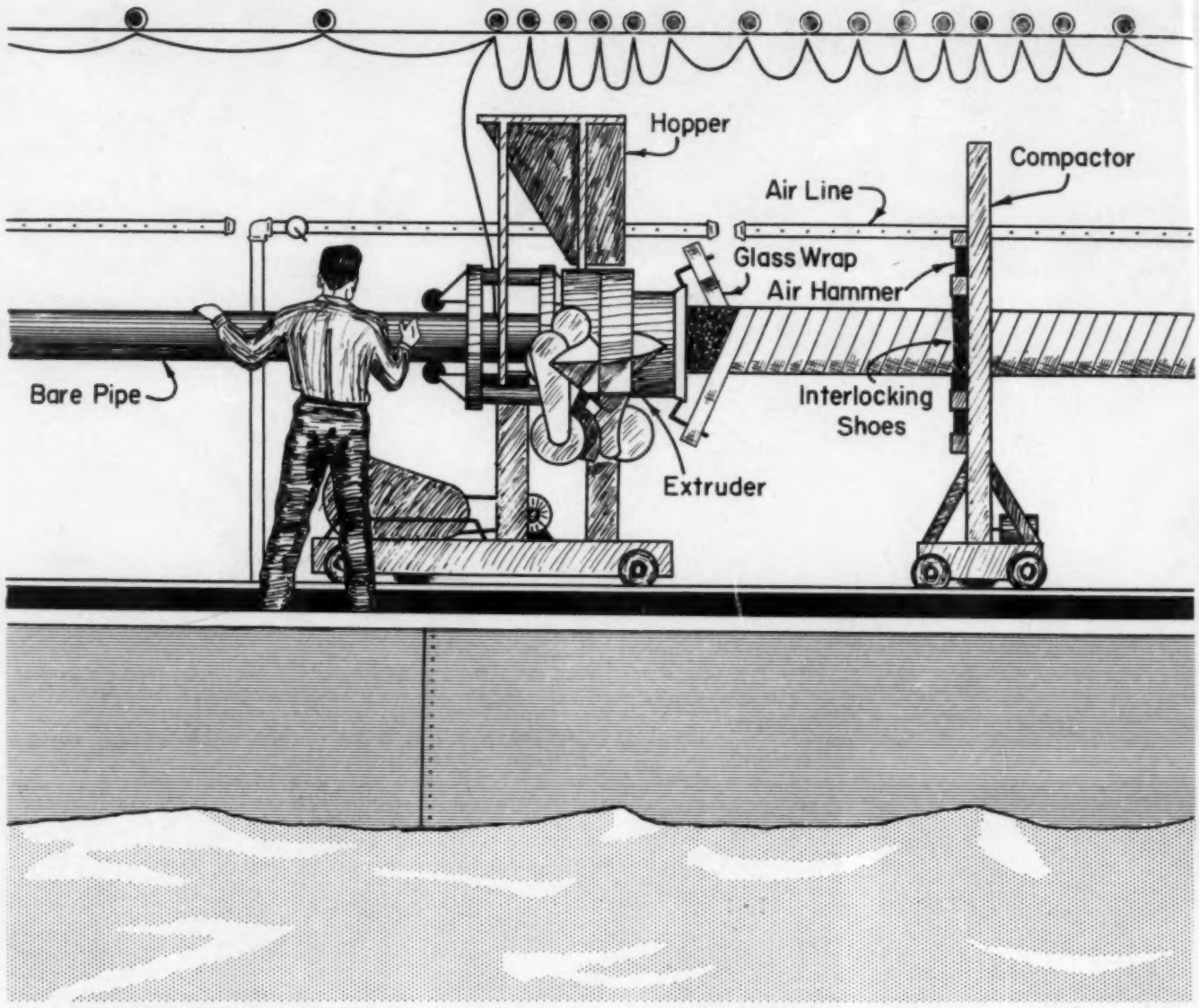


Artist's conception of offshore pipe-coating operation as the new glass fiber wrapped asphalt mastic coating is applied joint by joint. Weighing up to 250 pounds per cubic foot, it has high corrosion resistance, was developed for underwater pipe lines.

New Coating Shows Promise For Offshore Pipe Lines

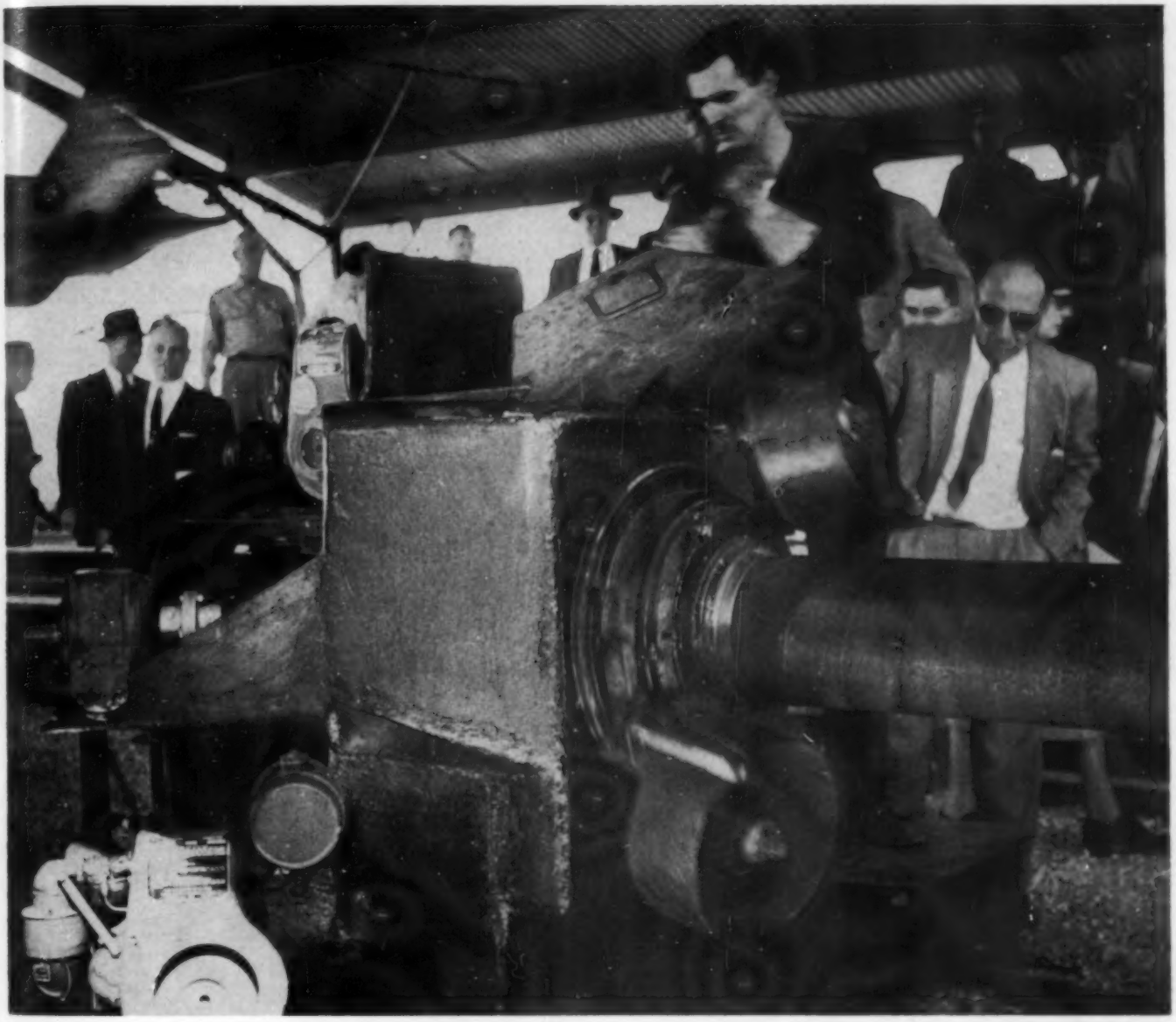
Asphalt mastic material weighs up to 240 pounds per cubic foot, has high corrosion resistance, and is as flexible as the pipe.

A NEW ASPHALT MASTIC material has been developed as a dual-purpose coating for marine lines. It serves as both a weight coating and a corrosion-resistant coating. Although in experimental stages today, the new coating is exciting the imagination of engineers throughout the Gulf Coast region.

The dual-purpose coating is a mixture of asphalt and barite aggregates internally reinforced with glass fibers and externally reinforced with a glass mesh outer-rap which further increases its resistance to shock and abrasion.

The application equipment is designed to apply the coating as the pipe is continuously laid into the Gulf from a conventional lay barge. However, the coating also can be applied in pipe coating yards or at any other convenient point.

The weight of the coating compares favorably with any type of weight coating. It weighs 130 pounds per cubic foot when ordinary aggregates of sand and crushed limestone are used. But when aggregates of ilmenite and barite are used a weight of 240 pounds per cubic foot can be achieved. A mixture which weighs



Coating process begins with hot asphalt mastic mix going into the hopper at the top; is extruded around pipe, wrapped with glass fiber.

230 pounds per cubic foot is being used in tests and demonstrations in New Orleans.

One of the unusual features of the coating is its unusual bond and resistance to cracking. The pipe can be deformed up to its elastic limit without damaging the coating. This means that should the coating prove feasible the minimum bending radius which can be allowed during the construction will be limited only by possible damage to the pipe.

Laboratory tests have shown that the new coating develops an unconfined compressive strength of over 800 pounds per square inch without deforming. In loads exceeding this figure it deforms without internal separation. For instance, under a total load of 60,000 pounds a 4-inch cylinder 2½ inches high deforms to a cylinder six inches in diameter and one inch high. This gives a compressive strength of 2000 psi with a 60 percent reduction in thickness.

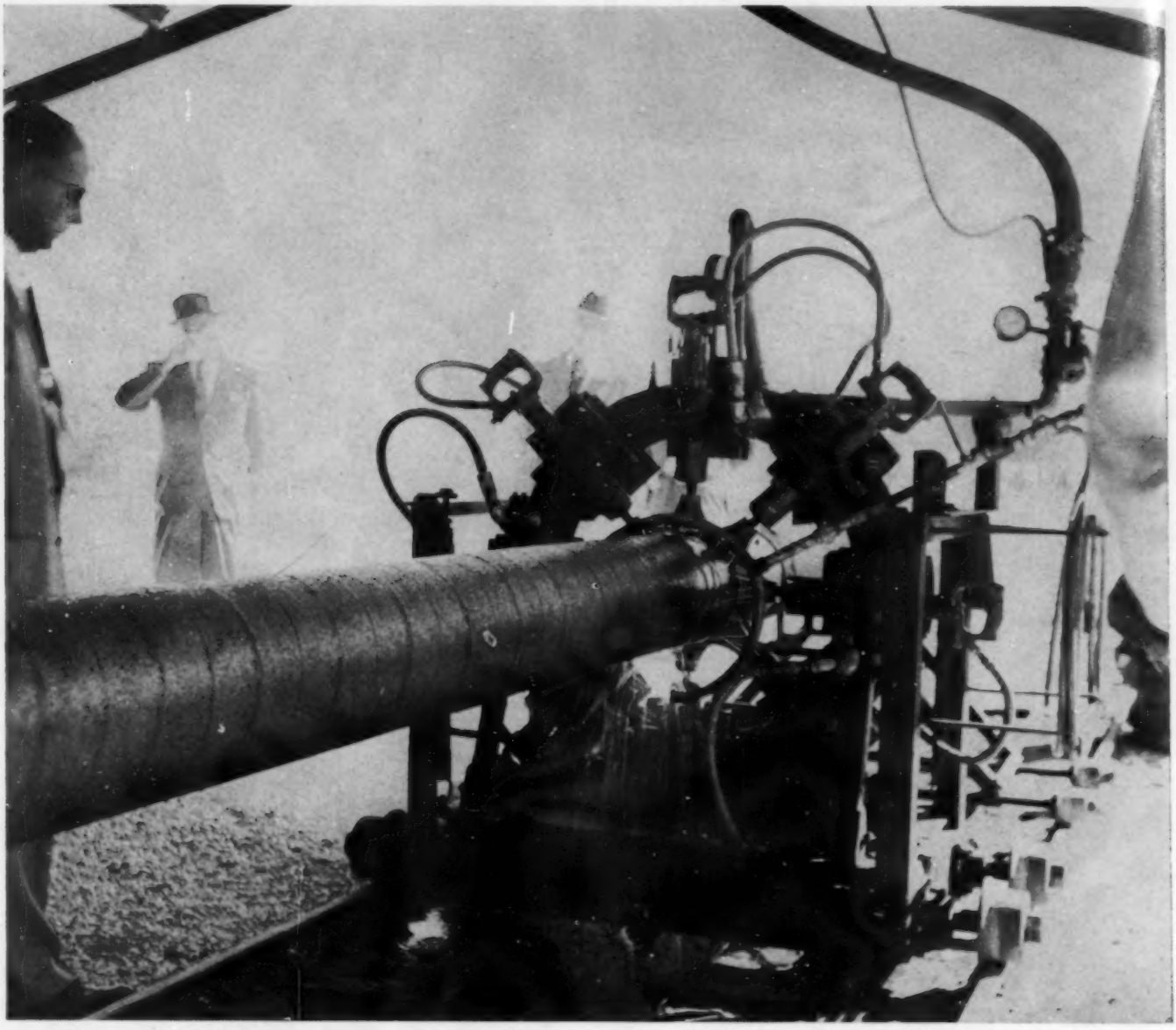
How It Is Applied. Basically, the process of applying the new coating to the pipe is simple. First, the pipe is cleaned and primed (the primer can be applied 2 or 3 weeks prior to the actual coating and still retain its efficiency).

Next, the coating is extruded onto the pipe at a temperature of approximately 300 degrees as the pipe moves continuously through the machine. A double wrap of glass fiber goes around the asphalt mastic as it comes from the extruding section. This glass fiber has two purposes. It holds the hot coating in place until it cools and it gives added shear strength to the outside of the coating.

The exterior of the coating is cooled with a water spray and then the coating is compacted by an encompassing circle of interlocking shoes driven by high-speed air hammers.

The last step in the process is to further cool the coating with water spray. When the temperature reaches 80 degrees or so the coated pipe can be subjected to any conventional handling inherent in construction practices.

The developers of the coating, who are planning to give it its first test early next year, recommend the following thickness and composition for underwater pipe lines having an assumed specific gravity of 1.3. Lines designed for a specific gravity of 1.3 will be 1.3 times heavier in air than



Then asphalt coating is compacted by air hammer. Interlocking compaction shoes increase the density and bond of the underwater pipe line.

the weight of fresh water displaced by the coated pipe.

Pipe Size Inches	Weight Lbs/Cu. Ft.	Thickness Inches
6⅝ x ¼ to 10¾ x 5/16	130	⅞* to 1⅛
12¾ x 5/16 to 18 x 11/32	170	1⅛ to 2
20 x 11/32 to 24 x 7/16	210	1¾ to 2
26 x 7/16 to 30 x ½	230	2 to 2½

* In fresh water a coating thickness of only ⅝ inch instead of ⅞ inch is required for the 6⅝ x ¼ inch pipe. All larger sizes require the same thickness in fresh water as that shown for salt water.

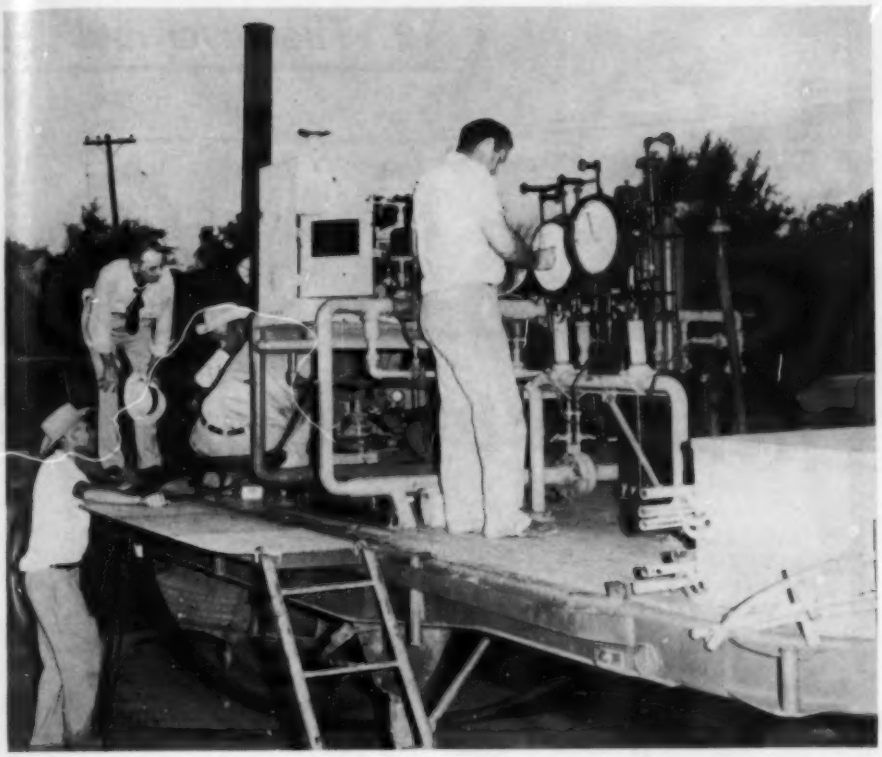
Electrical Resistance. Although corrosion-resistance tests are now under way in the most unfavorable pipe line areas of South Louisiana, the developer has relied on other tests of asphalt mastic coating to establish preliminary corrosion resistance ratings. In 1930 the API and the National Bureau of Standards made a joint study of pipe line coatings to evaluate their effectiveness. The findings of these studies were described in a paper, API Pipe Coating Tests Final Report, published in 1940.

The results of these tests which extended over a period of 10 years were very favorable for asphalt mastic. The average dielectric strength was five times as great as that of the next best coating and the maximum depth of pitting was only 40 percent as deep as the second best coating. This is why the developers of the coating are so optimistic. Their coating is thicker than the test samples used in the API experiment and also more dense because of the compaction and the additives of barite and glass fiber.

Another source of optimism is the toughness which asphalt mastics have shown when exposed to the severe climatic conditions or when submerged in fresh or salt water. Its successes under these conditions are apparent in highways, airport runways, jetties, or shore protection work.

One of the oldest engineering structures still serving the purpose for which it was originally designed is an asphalt mastic revetment at Assur on the Tigris River which was constructed at about 1300 B.C.

This new coating seems destined to find widespread use in the pipe line industry and at the same time, will give rise to other new competitive materials. —**The End**



WHEN ELDORADO, OKLA., gas consumers faced the situation of a natural gas line break in Red River, Lone Star Gas Company Pipe Line department's portable propane-air unit moved and supplied the town for 24 hours until repairs were completed. At right is J. N. Johnson, one of the operators sent from Irving, Texas, with the unit.

Propane-Air System Serves Town When Pipe Line Fails

LONE STAR GAS COMPANY Pipe Line department's propane-air plant from Dallas district headquarters at Irving and company men and equipment from North Texas and Oklahoma moved into Oklahoma's border town of Eldorado June 20 to restore a disrupted gas supply for 375 customers.

The Spearman Gas Company serving 358 local and 17 main line customers went out of gas at 6 p.m. Sunday, June 19, when high water and floating debris in the rising Red River washed out a dual 2-inch supply line crossing the river north of Quanah, Texas. The town and tap line are served from Lone Star's line A system.

Lone Star signed an agreement to purchase the Eldorado properties on March 28 of this year but is awaiting Federal Power Commission and Oklahoma Railroad Commission approval before completing the transaction.

M. L. Bird, Lone Star vice president, made arrangements for the mobile propane-air plant and distribution crews to aid the stricken town when word of the emergency was received in Dallas.

By noon Monday, June 20, crews from Frederick and Hollis and both equipment and men from Wichita Falls, Sherman and Dallas were converging on the town. Meters were turned off as preparations were made to set up the propane unit to feed the substitute fuel into the town's intermediate system.

By 10 p.m. all customers, except a few who were not at home to allow a safety check on appliances, were being served from the propane-air plant. A 900-gallon tank was supplying the gas with a 1000-gallon propane truck from Sherman standing by for additional supply.

Throughout the night Monday and all day Tuesday, the portable plant was in operation with a two-man crew from Irving alternating at the controls. H. L. Green, crew foreman, and J. N. Johnson, utility man, both of the Dallas Pipe Line district, delivered and operated the unit.

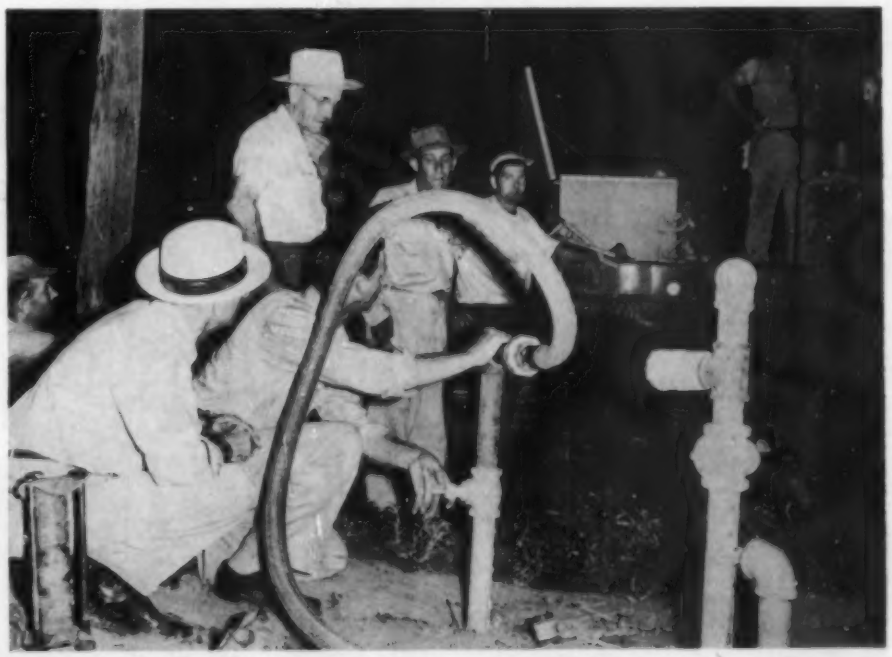
At 6:45 p.m. Tuesday natural gas again flowed through the town plant when a crew, under Pipe Line District Foreman Joe Martin at Vernon, was able to complete repairs to one of the 2-inch supply lines in the north channel of the river.

Otis Clark, Frederick district manager, supervised the distribution crews assisted by Bill Neal, Hollis subdistrict manager, and Ted Daniels, Eldorado manager for the Spearman Gas Company.

ACKNOWLEDGMENT

Reprinted from Lone Star Gas Company's *Blue Blaze*.

READY FOR TURN-ON, H. L. Green, of Irving, holding valve, waits for Johnson's signal to release propane-air mixture into the town's intermediate system.



In This Corner

W. F. Logue was born in Marshall, Ill. He was graduated from the Bartlesville (Okla.) High School in 1933 and started to work for Phillips Petroleum Company in the fall of the same year. After serving in the U. S. Army 1942-1945, he rejoined Phillips and is now buyer in the Purchasing department where he buys for pipe line construction and operations.

What Does a Buyer Expect of a Salesman?

By W. F. LOGUE, Purchasing Department,
Phillips Petroleum Company, Bartlesville

WHAT DOES a buyer expect of a salesman?

The answer might be summed up in two words—honesty and loyalty. Blessed with these attributes, such a salesman finds a ready welcome in any buyer's office.

The buyer and the salesman stand to gain from each call. Time is a precious commodity to both and it is essential that visits be conducted with dispatch. This will permit the salesman to make more calls and gives the buyer more time to see a greater number of salesmen.

As an example how time may be used honestly and efficiently is that of a salesman who called on a buyer to show two samples of a certain product. One sample was an average grade; the other a superior grade. The buyer had been purchasing the average grade because it was the type offered to his industry. However, the salesman pointed out that the superior grade could be bought at a price equal to that of the lesser grade. Both products had the same end use but the better quality had in the past been offered to a different industry.

This salesman had been looking for a better product to offer his customer and this attitude was deeply appreciated by the buyer. This salesman was not only efficient, but honest in his effort to improve the buyer-salesman relationship.

Unfortunately, all salesmen are not efficient.

There are the "time wasters" whose "techniques" might be characterized as the "Order Taker," "Eager Beaver," "Yacht Salesman" and "Quiz Kid." These types are "poison."

A number of sales people are still "just taking orders." The "order taker" generally breezes into the buyer's office and instead of getting down to business, wastes time recounting a long story in which the buyer has no interest. When he does get to the point his approach may

Continued on Page 26

. . . the salesman

In This Corner

L. W. Hubbell was born in Springfield, Mo. In 1941 he was graduated from the University of Oklahoma with a B.S. degree in electrical engineering and then joined Westinghouse Electric Corporation. In 1942 he joined the U. S. Air Force. He rejoined Westinghouse for about six months in 1946 and then became a partner in the firm of Riddle and Hubbell, specializing in power equipment sales.

What Does a Salesman Expect of a Buyer?

By L. W. HUBBELL,
Riddle & Hubbell Company, Tulsa

WHAT DOES a salesman expect of a buyer? No more than from any other person with whom he may come in contact.

Specifically, a salesman expects far more than a purchase order. Three attitudes or attributes which any buyer should have toward a salesman should be emphasized. They are:

Courtesy
Generosity
Honesty

By courtesy is not meant the friendly smile and warm handshake alone. It means consideration above and beyond the basic requirement of polite society. When a salesman calls, do not tell the receptionist you are busy and will call in a few minutes, and then leave the salesman waiting for many minutes or even hours. Time is the most precious possession the salesman has. He cannot afford to waste it, and a buyer should not require him to do so. If you find your business is going to require a much longer time than at first anticipated, advise the receptionist and determine the nature of the salesman's business. If it is impossible to see the salesman within a reasonable period of time, suggest to the receptionist that the salesman call on some other person in the firm who may be able to handle the problem.

Be considerate. A salesman's customer-calling hours are actually quite limited. The courtesy-conscious salesman usually plans his calls sometime after 9 a.m. to give the buyer time to open his mail and get his day's work organized. He usually stops making calls after 4 p.m. so the buyer can sign out the day's mail and close his business day. If the lunch hour is included, which may or may not be devoted to business, the salesman has actually seven hours in the day to contact his customers. If he is

The salesman expects the buyer to be generous . . . not necessarily with his business, but with information, praise or criticism

required to "cool his heels" before each call he can easily waste many precious minutes and hours during the day, thus reducing his effectiveness to his company.

One of the most flagrant offenders against the rule of courtesy is the buyer with the "sharp tongue."

Salesmen are taught from the beginning that the customer is always right, but it is surprising how many buyers take advantage of this situation. There was the buyer for a large oil company who told the writer his company was "unquestionably the lousiest bunch of people with whom I have had to contend, your service is worse, and I don't know why my company continues to do business with you." The misunderstanding centered around my company's unsuccessful effort to obtain a repair part for a piece of apparatus which had been made 25 years ago and which was worth $3.50 and was no longer being made by the manufacturer. The buyer refused to believe we were trying to do everything possible to serve him and had spent approximately $25 in long distance calls to meet his requirements. Even when this was fully explained, the buyer's only reply was that we were "not even trying to serve" and this was punctuated with obscene remarks. Fortunately, this type of buyer is rare in the industry, but the harm he does his company is tremendous.

Be generous. Generosity is the second attribute a salesman expects to find in a buyer. The type of generosity here implied is not that whereby a buyer gives all or most of his business to one salesman or company. It is that of information, criticism or praise. "Generosity of information" means that the buyer should be generous in specifying exactly what he wants and the conditions under which a specific piece of equipment is expected to operate. For example, let him not just call on the phone and ask for the price of, say a 50 hp motor without furnishing all the basic information. Much time and money can be saved and faster service given if the buyer is more generous with this type of information.

Then there is generosity as it applies to praise or criticism. Everyone appreciates a word of thanks or a pat on the back for a task well performed. But frankly, the good salesman would be happy to receive constructive criticism. This sometimes takes a bit of backbone on the buyer's part, but if a salesman is to do a good job, this type of constructive criticism is very necessary. For example, a buyer may have found some particular condition about a piece of equipment that is giving more difficulty than it should. In cases where this kind of generosity is lacking, the buyer may decide to purchase his future needs from another company. Salesmen make no claim as to the perfection of products but believe their company is doing its utmost to build the highest quality possible into the item offered for sale. However, operators who use the equipment in the field will undoubtedly discover things about any apparatus which are a source of trouble and that could be improved. When such things are found the buyer, instead of condemning the product and severing relations with the seller company, should pass along the information to the salesman and see if the situation can be remedied. This kind of generosity is deeply appreciated by a good salesman.

Be honest. Finally, there is the question of the buyer's honesty toward the salesman. Honesty is basic. The buyer should be honest about the requirements of an application for a piece of equipment and what and how the equipment is expected to perform. He should be honest about his requirements. He should avoid wasting the salesman's time and his company's money in making unnecessary trips to field or office. Fortunately, it does not often happen, but there are times when the buyer lacks honesty in setting forth his requirements. There are times when such a buyer will tell the salesman that the requirements are such and so, and in the final analysis they turn out to be 100 percent wrong. Usually the salesman does not learn this until the apparatus has been sold, installed and operating. If it fails to function properly or meet the conditions for which it was intended, the buyer asserts that the equipment is "no good." Had such a buyer been honest in the first place he would not only have been supplied with the right piece of equipment but he would have saved the salesman and his own company's time and money.

The buyer's actions toward a salesman, to a great measure, form that salesman's impression of the company with which he is doing business. It should be noted that as his company's representative, the buyer's actions and statements bring credit or discredit to his entire organization, be it large or small.

If the buyer is courteous, generous and honest the salesman will be in a position to render more efficient and economical service.

The Buyer Speaks . . .

Continued from Page 24

be: "What are you buying today?" In many instances the buyer, not having a requirement for the product the salesman has to offer, must tell him so, thus ending the conversation. That was a wasted visit. Nothing was accomplished by either party.

Don't waste time. When a salesman is planning a call he should consider, not alone the time he plans to consume, but the time the buyer may be in a position to allot him. When a salesman knows a buyer is going through a busy period he should have definite business to transact. If the call is purely social he should phone the buyer to determine if he can be of service. If the answer is "No" he should terminate the conversation, telling the buyer he will make a personal call later when the buyer

Cordiality is expected by the buyer . . . but he is wary of the chronic glad-hander, back-slapper, chair mover, and buddy-buddy type of salesman

has more time, or when he has business to transact. This consideration will be appreciated by a busy buyer.

The honest and efficient salesman, when offering a new product, should have all the descriptive literature with him and, if possible, have his sample case ready to show the product.

Generally, most new products are presented in a satisfactory manner. However, occasionally the buyer comes up against the "Eager Beaver" type who offers his product, describes it briefly and promises to send full information "later." This type of salesman conveniently "forgets" to send in the promised information and if he is asked about the product during a subsequent call will apologize saying he had been mistaken in his belief that his company had such a product. This salesman, besides being a time waster, is certainly not honest.

Don't back-slap. Cordiality is expected and appreciated by a buyer, but he is wary of the chronic glad-hander, back-slapper, chair-mover and buddy-buddy. This is the "Yacht Salesman" type whose approach is not confined to a discussion of the merits of his product, but to his wide acquaintance in the company, the "yacht" he has available for the buyer's convenience, and the entertainment he has to offer at a moment's notice. This type lodges at a local hotel for several days, keeps the buyer's phone busy, drops in at least once or twice daily and generally assumes the status of "old buddy." He feels the chairs in the buyer's office are arranged badly so proceeds to move one around to the buyer's side of the desk. Punctuated by a jovial back-slap, this salesman emphasizes that his company "sure wants the business" and wants to know if there is anything he can do for the buyer to get it.

Does he get the business? Scarely. The buyer, after all, was not looking for a "yacht ride."

Then there is the "Quiz Kid" type salesman. If he loses an order to a competitor he pesters the buyer with numerous questions which may run something as follows: "Were we high?" "What percentage?" "Who got the business?" He forgets he would not care to have his own quoted prices revealed to a competitor and he places the buyer in the embarrassing situation of having to decline to answer.

The mailed quotation resulting from an inquiry brings varied and interesting questions from salesmen. Some questions are phoned in the same morning the quotation has arrived and before the buyer has had time to study it the salesman is asking: "How does my quotation look?" "Is the price right?" "Have I quoted properly and is there anything else I can do?" The considerate and efficient salesman realizes that the buyer cannot answer such questions and that if he has offered the right product, at the right price and with satisfactory delivery he will get the business.

Prove your loyalty. Finally, there is the quality of loyalty which a buyer expects to find in a good salesman.

This point may be illustrated by an incident which occurred recently and in which a certain oil company had certain instruments in service which were not operating properly. The buyer twice requested the salesman to go to the field and take care of the difficulty. In each case the salesman acted promptly and reported back, stating that certain unusual factors were involved, since his company's equipment was sound and in other locations was working properly and satisfactorily. After a third trip it was determined that the cause of the trouble was not with the instruments but was due to materials used in conjunction with the instruments.

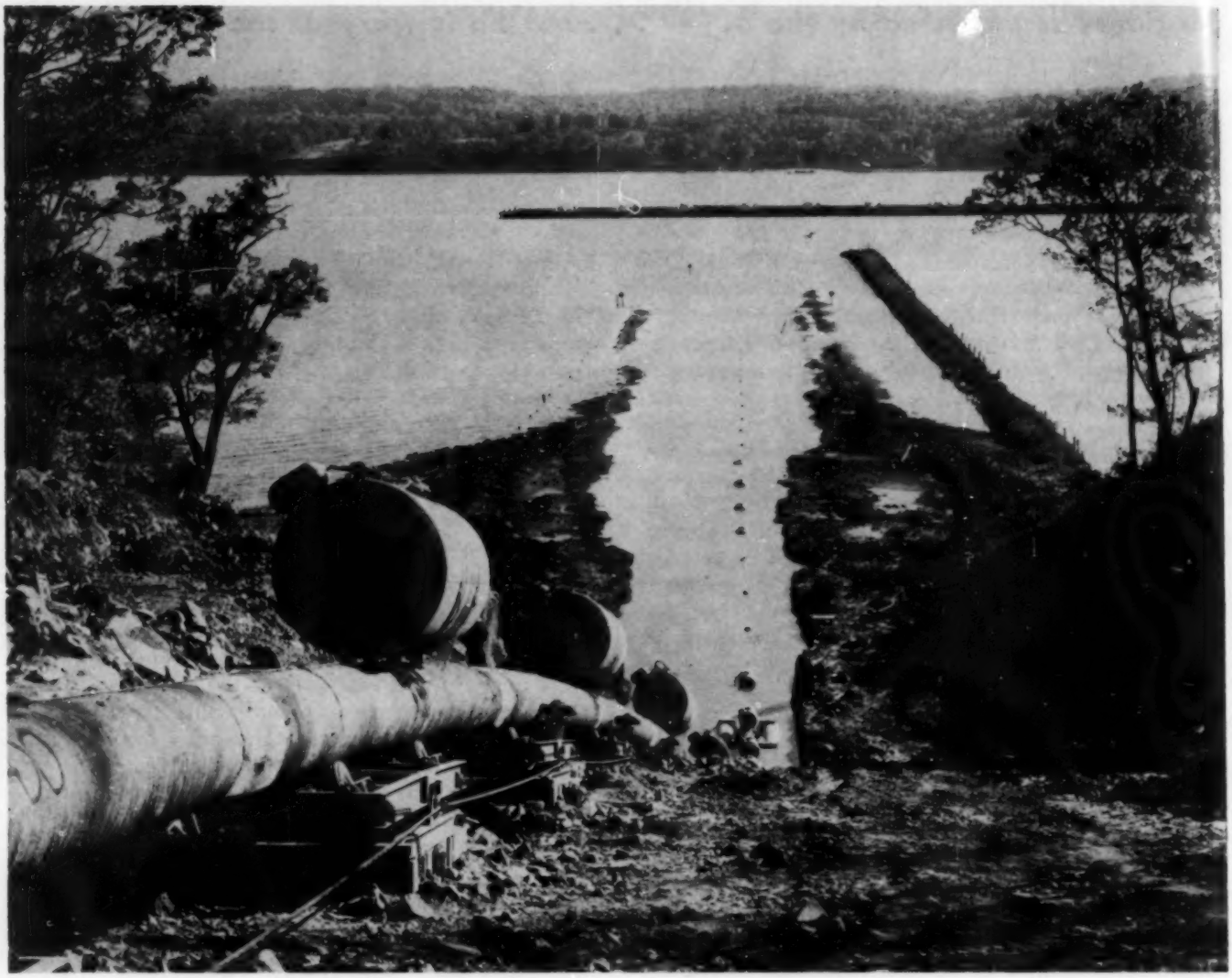
When the situation was finally clarified, the oil company not only thanked the salesman for his efforts in attempting to solve the difficulty but apologized for suggesting that his equipment had much to be desired, and for the time and effort expended during this difficult period.

This salesman certainly proved his loyalty to his company as well as to his customer and improved his standing with the buyer.

Management, and especially that which characterizes the aggressive oil industry, expects a job to be well and promptly carried out. This is particularly true during periods of new construction when the job is given to the buyer to obtain the right material at the right price and at the specified time. This is when the buyer appreciates the salesman who knows his business, does not waste time and can be counted upon for loyal service, especially in the pinch.

Since the buyer cannot exist without the salesman he will try to see all who call and show them the same respect regardless of type. However, the buyer is certainly pleased to welcome into his office the salesman who measures up to standard.

For helpful, time-saving, and money-saving ideas, don't miss Rules of Thumb (Page 66) and Hints (Page 82) . . . regular features in PLI



Down over the Palisades on the west bank of the Hudson River drops the first of Tennessee Gas Transmission's dual 24-inch lines. The sheer of the cliff is emphasized by the disappearance of the pipe line half way down the launching ramp. Traffic on the busy waterway continues without interruption as a barge tow passes over the pulling cable and pipe in midstream. Successful completion was made in 12 days.

How 8 Million Pounds of Pipe Was Lowered Down a 150-foot Cliff

Tennessee Gas Transmission Company's dual 24-inch underwater crossing of the Hudson River from the Palisades to Dobbs Ferry, N. Y.

By HARRISON T. BRUNDAGE,
Pipe Line Industry Staff

EVEN FOR pipeliners, the top of the Palisades along the west bank of the Hudson River above New York City is a tough spot for launching two 24-inch concrete coated pipe lines. From the top of this cliff to the bottom of the main channel the pipe ditch drops nearly 270 feet.

This was the last major natural obstacle to Tennessee Gas Transmission Company's new pipe line to serve New York City and northern New Jersey. It was overcome October 31 with the successful completion of the dual crossing. Just twelve days earlier, the towing buoy on the head of the first 875-foot section of pipe entered the river.

When the last 12-mile stretch westward from the Hudson is finished, TGT's 250-mile link between storage facilities at Hebron in Potter County, Pennsylvania, and Greenwich, Conn., via Westchester County, New York, will be completed.

Teamwork and Experience. General contractor for the river crossing operations was Bechtel Corporation of New York and San Francisco. Sub-

To lighten the drag against the river bottom during pulling of the pipe line, pontoons were secured to the top of the concrete-coated pipe every 63 feet. Here two-inch, high-tensile steel bands are cinched on the pipe.

contractor was Collins Construction Company, which provided pipe line launching and pulling equipment for the underwater pulling operations; and Missouri Valley Dredging Company, which did the excavation and backfill work. Tugs, workboats and derrick barges were supplied by Gates Marine Service of Little Ferry, N. J.

The Hudson River is 7084 feet wide at the crossing site. Maximum depth of the river is 51 feet in the channel near the east bank. Missouri Valley Dredging cut a trench 25 feet deep and 50 feet wide across the bottom to provide for the two lines. In the deepest part of the channel, the lines were laid 76 feet below the surface of the water. River traffic makes the Hudson a busy waterway, so contractors pulled the lines across on the bottom of the river by the method developed by Collins using special launching ways and a patented pontoon system for controlling buoyancy during pulling.

The 24-inch outside diameter seam-

Nine hundred feet back from the west bank tie-in station, Collins Construction Company crews set up the holdback winch (left). It kept an average backpull of 140,000 pounds on the pipe for positive control. The pulling winch (right), built by Collins especially for large river

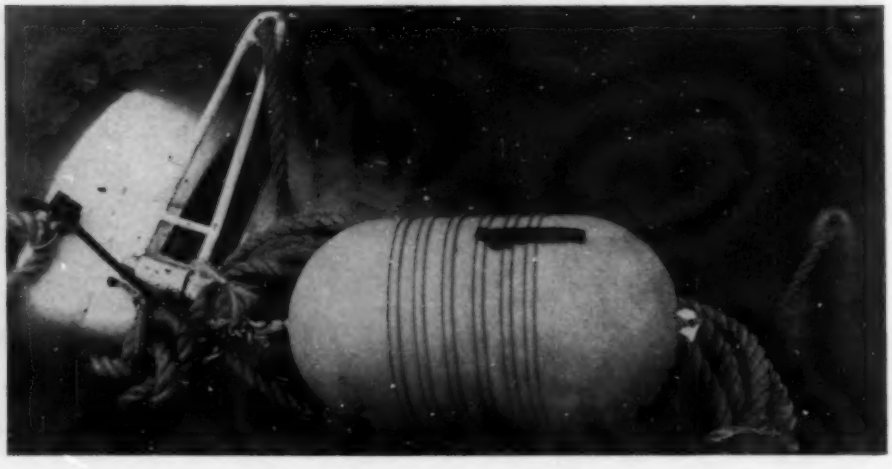
crossings, was set on a steel H-beam concrete foundation on the east bank of the Hudson near Dobbs Ferry. Operators coordinated control of the two winches by radio and standby visual signals.

The holdback head welded to the back end of the first 875-foot section of line reaches the tie-in station atop the west bank. Side-boom tractors hold the vertical arms of clamps to steady the pipe as it moves down the steep slope.

less line pipe, expanded by a cold process has a wall thickness of one-half inch. Length of individual joints varied from 35 to 45 feet. This pipe has a minimum yield of 52,000 pounds per square inch. Individual sections of pipe were coated and wrapped with coal tar, glass fiber wrap, glass felt, coal tar enamel, and asbestos felt. To add weight, Rosson-Richards crews then coated the pipe with 3¼-inches of ilmenite aggregated concrete weighing 212 pounds per cubic foot. Total weight of the pipe was thus increased to an average of 550 pounds per foot in air.

As soon as the concrete coating had cured, sections of pipe were weighed and numbered in the yard and trucked to racks near the launchway

The lead end of the first section of pipe (left) is hoisted onto the "monkey motion" barge and in a few minutes the actual pulling of the first pipe line begins. A buoy (above) mounted on the towing block helps to lead the towing cable fair along the bottom. It sinks into the water as the pull begins. To release the pontoons from the pipe after it is across the river, Collins engineers use the patented releasing mechanism shown below. A pull on the steel cable releases the buoy which carries the manila rope to the surface. A tug on this rope actuates the eccentric arm at left cutting the steel bands and allowing the pontoons to float to the surface.



A standing holdback held the river line securely during tie-ins. The cellar clamped to the pipe in the foreground was anchored to the "deadman" by two steel cables. Engineer checking dynamometer found average pipe tension during tie-ins was 160,000 pounds.

Welders cut holdback head from the last section of pipe pulled into the river to make preparations for welding on the next section from the Palisades launchway.

To help align the river section with the next 875-foot section to be pulled, a large bucket weighted with sand is used to bend the downhill section into place.

A hopper filled with concrete is centered over the welded and coated field joint. As soon as the freshly concreted joint has cured sufficiently, pulling continues. Average time required for tie-ins was five hours.

Pulling of the first 24-inch concrete coated pipe line in TGT's dual Hudson River crossing nears completion as the buoyant towing block comes up at the eastern bank near Dobbs Ferry. Pulling winch then moved 25 feet upstream; job of second crossing began.

atop the Palisades. There welding crews made up 16 strings, each 875-feet long. In keeping with standard submarine practice, all welded joints were X-rayed; then each string was plugged and given a hydrostatic test to 1200 pounds per square inch.

Stationary pneumatic rollers, with rubber tires mounted at proper angles to hold the pipe steady, were installed by Collins crews to provide a 600-foot, 25-degree maximum grade ramp down the Palisades bluff. These guided the pipe to the river's edge preventing damage to the pipe or concrete. At the river, Collins' "monkey motion" barge supported the pipe line as it entered the water adjusting for variations of the river level due to tides and giving the pipe a favorable overbend into the water. Radius of pipe bends on the hillside was about 1200 feet. Even on this steep bluff there was very little cracking of concrete during the pulling of either of the two lines.

To reduce the negative buoyancy of the pipe to 25 pounds per foot during the pulling operation, Collins' crews lashed pontoons to the pipe at 63-foot intervals using three pairs of double bands of two-inch, high tensile banding steel. Each pontoon was rigged with a releasing mechanism, an eccentric tripping device to cut the bands when the pull was completed. Small buoys secured to the pontoons pulled the releasing lines to the surface. By this method, after the pipe line has been pulled across the river, pontoons are released and the pipe settles into the river bottom ditch.

Winches Kept Pipe in Tension. To pull the heavy lines across the Hudson, Collins Construction crews set up a specially designed winch on the east bank. A holdback winch, set in place at the extreme end of the level launchway on the Palisades maintained tension on the pipe as it moved across the river. Each winch was secured to a steel H-beam piling concrete base. A standing holdback, "deadman," held tension on the pipe while each new section was tied-in. Average deadweight load on the standing holdback was about 110,000 pounds. Dynamometer readings were watched closely at all times during the pull to prevent damage to the pipe. The average tension during actual pulling was about 65,000 pounds. Four side-boom tractors held clamps on the section of pipe being launched and steadied it as it moved down the steep slope.

While sections of pipe were being made up for the pull at the launchways, a marine crew laid the double 1¼-inch steel pulling cable across the river. This cable was reaved through a buoyant, single-sheave roller bearing block to pull the lead end of the first section of pipe.

During the 24-hour cable laying operation, the first 875-foot section of pipe was lowered down the Palisades ramp. A derrick barge lifted the lead end onto the "monkey motion" barge and the pulling operations were ready to begin. When the rear end of the first section was about to clear the top of the launching ramp, the next section was moved onto the level ramp. The standing holdback collar was fastened near the top end of the river line and tension was applied to the line by slowly pulling against the standing holdback. A new section was lined-up and welded. The weld was X-rayed, and the field joint was concrete-coated and allowed to cure. Each tie-in took about five hours. Rigging the line with pontoons required only about two hours time, so there was no delay between tie-ins. Maximum rate of pulling the lines was about 20 feet per minute with an average rate of 12 feet during actual pulling operations.

The downstream line was pulled first. When it was across, both TGT and the contractor's inspectors, checked the depth of its entire length using Collins' specially-designed fathometer.

As soon as it was accepted, pontoons were released from the pipe and recovered aboard a barge for the second line. Within 24 hours the pulling winch had been moved 25 feet upstream, launchways readied, and cable laying operations were again under way.

Using the same procedure as for the first line, the second was pulled without incident and the first trouble-free crossing of the Hudson River was completed on October 31.—**The End**

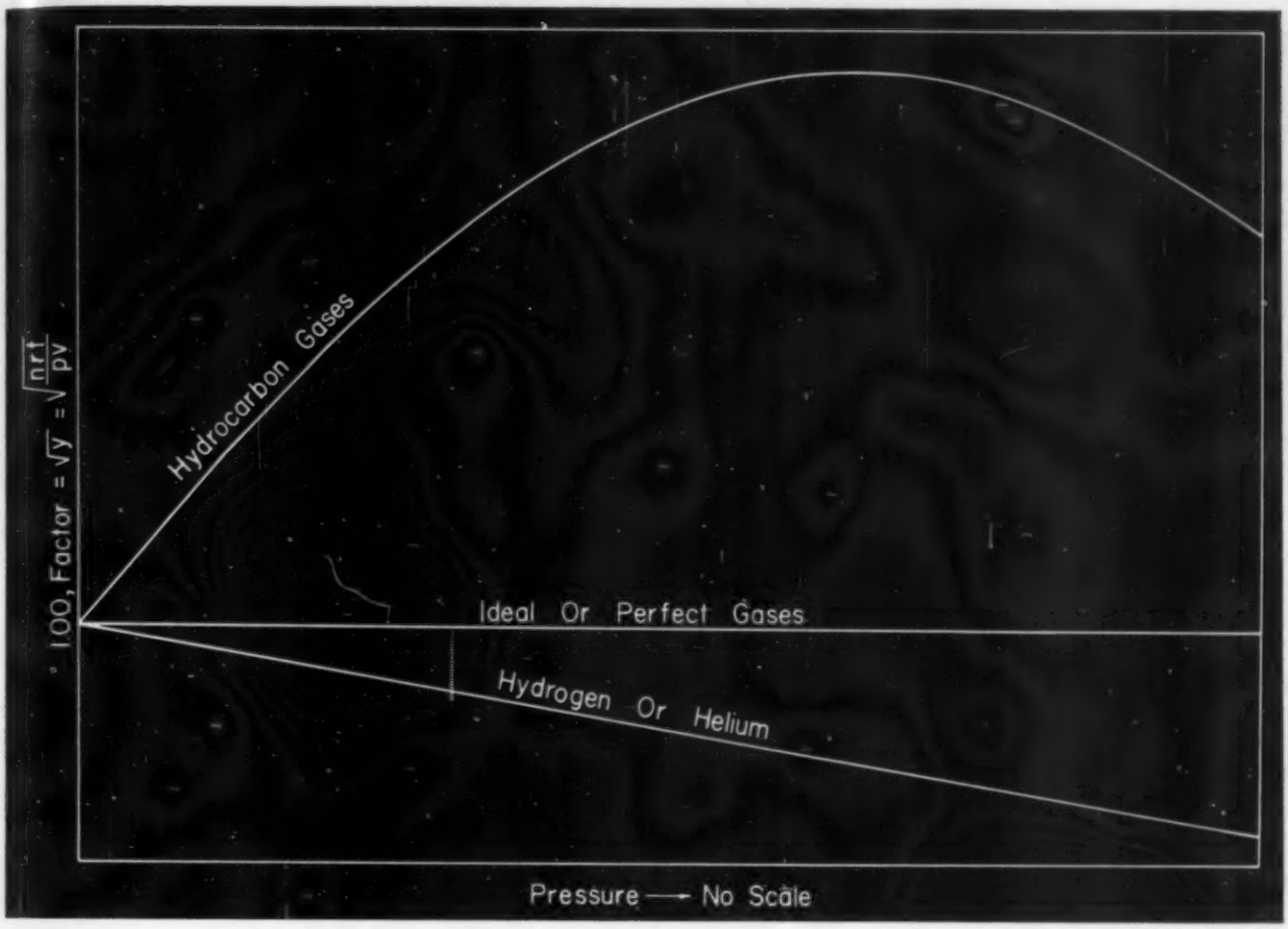


FIGURE 1

A must chapter for every pipe line engineer's notebook

Supercompressibility Made Simple

- For natural gas the Fpv factor increases about 1 percent for each 100 pounds added pressure until the point of greatest deviation is reached.
- If measurement is to be accurate at high pressures, supercompressibility must be considered.
- The problem becomes: How best to arrive at the Z ratio, from which Fpv (supercompressibility factor) is found.

By D. H. LINDSEY
Northern Natural Gas Company
Omaha

THE VOLUME OF a body of gas is not easily defined. Solids can be measured by the pound, liquids by the gallon, but, as gas expands to fill any container in which it is placed, the unit of measurement must specify both a pressure base such as 14.65, 14.73, 16.4 pounds per square inch, and a temperature base such as 60° F.

If gas is contained or measured at any other than base conditions, Boyle's Law and Charles' Law are used to correct the volumes to base conditions. An ideal gas will vary in volume inversely with absolute pressure,

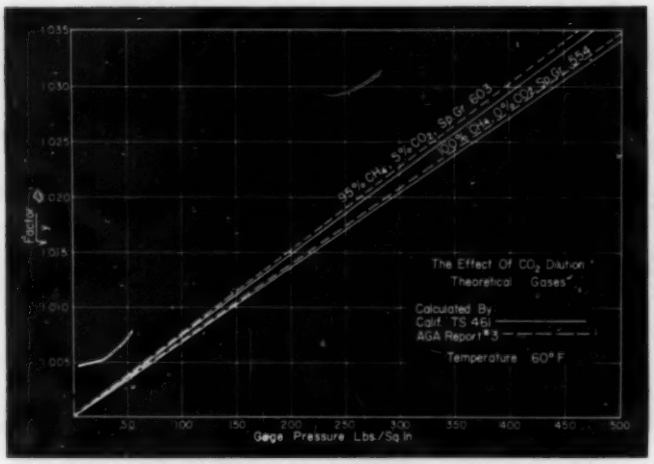


FIGURE 2

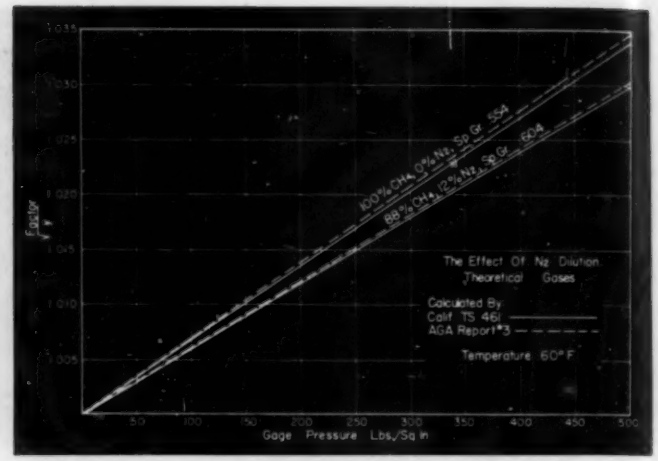


FIGURE 3

which is gage pressure plus pressure of the atmosphere. It will vary in volume directly with absolute temperature (often called degree Rankine).

In algebraic terms, PV = nRT, where P represents absolute pressure in any standard unit, V volume, n the units of gas present, T absolute temperature, and R is merely a constant that takes care of the different volumes for the different pressure and temperature units that may be used. For instance, if P is in pounds per square inch, V in cubic feet, T in °Rankine, R will be 10.731.

These Laws of Ideal Gases work at low pressures. Experimenters who first stated them had no way to compress gas to pressures known today. They could prove their statements within the limits at which they worked. At higher pressures, however, there is a great difference in the behavior of an ideal or perfect gas from that of natural gases. In algebraic terms this means putting in a multiplier Z, making the formula read PV = ZnRT.

Z is one form of the supercompressibility factor to be used. Actually, in orifice measurement $Fpv = \sqrt{\frac{1}{Z}} = \sqrt{y}$ is used; y being greater or less than 1, depending on molecular size and weight (Figure 1).

If a gas molecule has appreciable volume but is light in weight there will be little gravitational attraction between nearby molecules. $\sqrt{y}$ then decreases uniformly with added pressure, as is shown on the curve (Figure 1) for hydrogen or helium, the lightest gases. Heavier molecules of gases such as natural gas have a greater gravitational attraction for each other. Because of this the $\sqrt{y}$ curve increases rapidly with added pressure until a maximum is reached, at a pressure around 2000 psig depending on temperature. Slope of the curve and point of minimum values vary from one gas to another. All this can be proved mathematically and experimentally. For present purposes it is enough to realize that for natural gas the Fpv factor, or $\sqrt{y}$, increases about 1 percent for each 100 pounds added pressure until the point of greatest deviation is reached. Maximum orifice measurement change is about 20 percent.

It thus becomes necessary to consider supercompressibility if measurement is to be accurate at high pressures. So the problem becomes how best to arrive at the Z ratio, from which Fpv (supercompressibility factor) is found.

Attempts have been made to do this mathematically. The Equation of State by Van der Waals is the best known, but fails in practice. In all, over 30 Equations of State have been proposed, but all are too unwieldy to use with known mixed gases.

Actual test, the most satisfactory method of obtaining the Fpv factor, is extremely slow. Three types of apparatus have been devised, the Bean, Beckman, and Burnett types. The Bean and Beckman apparatus operate on the same theory, expanding a sample of highly compressed gas from a calibrated steel bomb into an accurately calibrated container at or near atmospheric pressure in steps of approximately one atmosphere.

The Burnett apparatus is faster, the sample pressure being reduced approximately to one half at each step, three or four expansions being enough to calculate a Fpv curve.

The tests are time consuming; only one supercompressibility determination can be made per day with the Bean apparatus. Three to four supercompressibility determinations can be made with the Burnett apparatus. The data obtained must be tabulated, calculated, and curves drawn in a long and expensive proceeding.

For this reason three major studies were undertaken to give Fpv values in terms of other properties of the gas. The first two, NGAA and CNGA, are approved by state commissions in gas producing states. The third method, developed by AGA's Gas Measurement Committee Report No. 3, carries the approval of the U. S. Bureau of Standards.

The NGAA method requires a complete analysis of the gas, either by fractional distillation or by mass spectrometer. The percentage of each pure gas present is multiplied by its critical pressure and its critical temperature as found in tables provided. These results or weighted averages are the pseudocritical pressure and temperature. They are divided into the pressure and temperature conditions for which supercompressibility must be known, and Z values read from curves. Fpv is then calculated, since it is equal to $\sqrt{\frac{1}{Z}}$.

The CNGA method improves on this method, simplifying it and tabulating in terms of gravity, carbon dioxide and nitrogen. The California Natural Gasoline Association found that in all hydrocarbon gases considered, critical pressures and temperatures were in simple relationship to

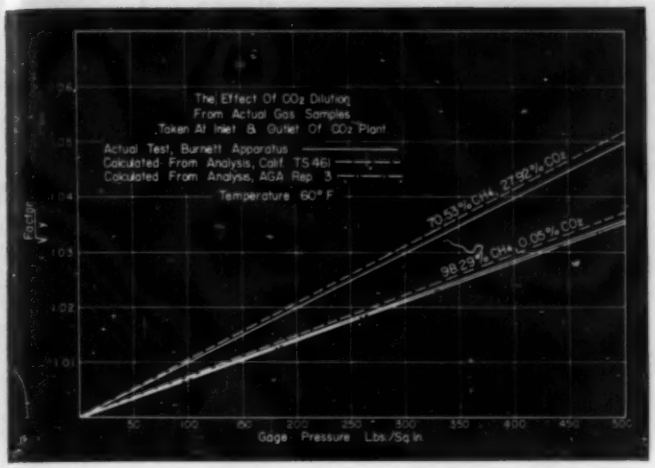

The Effect Of CO2 Dilution
From Actual Gas Samples
Taken At Inlet & Outlet Of CO2 Plant
Actual Test, Burnett Apparatus
Calculated From Analysis, Calif TS 461
Calculated From Analysis, AGA Rep 3
Temperature 60° F
70.53% CH4, 27.92% CO2
98.29% CH4, 0.05% CO2
Factor
Gage Pressure Lbs./Sq.In.

FIGURE 4

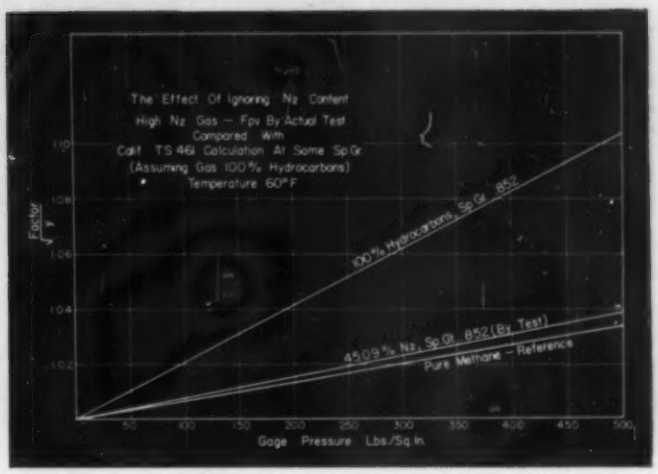

The Effect Of Ignoring N2 Content
High N2 Gas — Fpv By Actual Test
Compared With
Calif TS 461 Calculation At Same Sp.Gr.
(Assuming Gas 100% Hydrocarbons)
Temperature 60° F
100% Hydrocarbons, Sp.Gr. .852
45.09% N2, Sp.Gr. .852 (By Test)
Pure Methane — Reference
Factor
Gage Pressure Lbs./Sq.In.

FIGURE 5

specific gravity. Thus if the gravity of any hydrocarbon gas were known, Fpv could be predicted without going through all steps of the NGAA method.

This does not work unless the gas is 100 percent hydrocarbon. Nitrogen and carbon dioxide, the most common diluents, deviate much less from an ideal gas than do hydrocarbons and in opposite directions (See Figures 2 and 3). In the CNGA bulletin TS 461 tables are provided to make adjustments for either of these diluents, up to 24 percent. AGA Report No. 3 provides diluent correction to only 5 percent CO_2 and 12 percent N_2, hence the limits at which these curves have been drawn. The curves are based on a simple mixture of methane and the diluent gas.

If enough is known about a gas to use the CNGA method properly, answers at medium pressures check actual test results very well (See Figure 4). As it is sometimes difficult to get a satisfactory analysis, a quick Nitrogen determination would be desirable. Since the final Fpv factor decreases approximately 1 percent for each 10 percent of nitrogen content at 500 pounds pressure, Fpv factors will be high if nitrogen content is ignored. See Figure 5 based on an actual Burnett test of high N_2 gas; note how very much lower the actual test is than the value computed from gravity alone, using CNGA without N_2 correction. Similarly, Figure 6 shows the results of a gas containing high percentages of CO_2.

In line with the earlier statement that Z values are a function of molecular weight, note Figure 7. From the gravities of the components, methane, ethane and propane, gravity of a simple mixture of these was computed. Using CNGA tables of pure hydrocarbon gas, note how Fpv (or $\sqrt{y}$) value increases with added higher hydrocarbons.

Experience has shown that Fpv values as calculated from CNGA or NGAA methods do not check actual test results at pressures above 500 pounds. For this reason a more extensive study was carried on from 1950-53, as described on page 78 of the AGA Gas Measurement Report No. 3. More than 500 tests were made on several Burnett apparatus, and results were used to make up tables 15A, B, C, D and E of the report. On pages 87 and 88 of the report are given the final recommendations—do not expect these answers to be accurate if more than 5 percent CO_2 or 12 percent of N_2 is present.

Promised expanded tables for Fpv values have been prepared and are available from AGA. This is in line with paragraph 73, page 19, of Report 3, which says the tables as included in that report are "intended to be used as a basis for developing convenient operating tables." It was evident that the original tables, printed as tables 16-A, 16-B, 16-C, 16-D and 16-E, were too unwieldy to be practical.

The new tables are in seven volumes, the result of two to three million calculations made by electronic computers. Actually two separate sets, volumes one to six are the results of the base Report 3 data, converted to gravities other than, and including, the 0.6 Specific Gravity data of that report for the conditions that CO_2 and N_2 are not present in the gas. The data are presented in tabular form, with gravity range of plus or minus .002 applicable to each page. Thus a page calculated for .680 would also fit .678, .681 and .682.

Column headings for temperature vary by steps of from 2° F. to 4° F., over a range of 0° F. to 180° F., column headings for pressure are 10 pound intervals to maximum 3000 psig. Instructions are the same as are found in the CNGA tables—"do not interpolate, each reading includes to the next higher reading." Therefore a temperature of 67.7° F. and pressure of 439.5 psig would be called 66° and 438 pounds to find the Fpv value. Values are calculated to one more significant place than CNGA tables.

As stated in the preface of volume one, other diluent gases may be present and the tables still be used. This describes a gas from perhaps California or the Gulf Coast area but not from the Hugoton Area. CO_2 and N_2 are quite different in Fpv characteristics; for that reason they need special treatment.

Volume seven is the one that can be used—up to its limits. So arranged to be complete in itself, it could be used for CO_2 and N_2 free gas instead of the first six volumes. It is set up with each page covering a range of gravity as described above, but tabulated with vertical columes of CO_2 in intervals of 0.2 percent, and against horizontal rows of N_2 in intervals also of 0.2 percent. The CO_2 spread is as defined in Report 3, from 0 to 5 percent, and N_2 from 0 to 12 per-

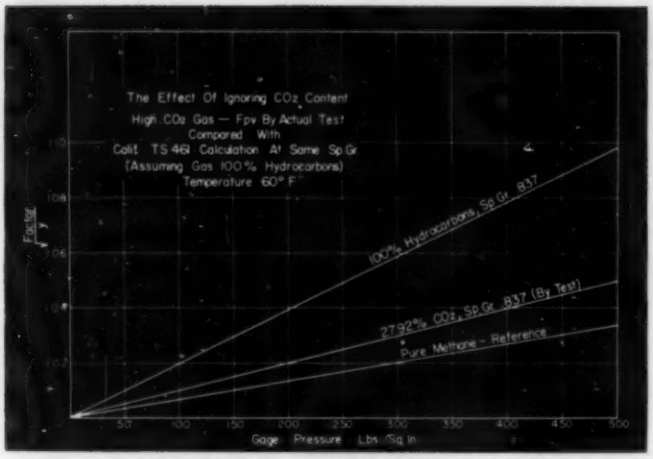

The Effect Of Ignoring CO2 Content
High CO2 Gas — Fpv By Actual Test
Compared With
Calif TS 461 Calculation At Same Sp Gr
(Assuming Gas 100% Hydrocarbons)
Temperature 60° F
100% Hydrocarbons, Sp Gr .837
27.92% CO2, Sp Gr .837 (By Test)
Pure Methane - Reference
Factor
Gage Pressure Lbs./Sq In

FIGURE 6

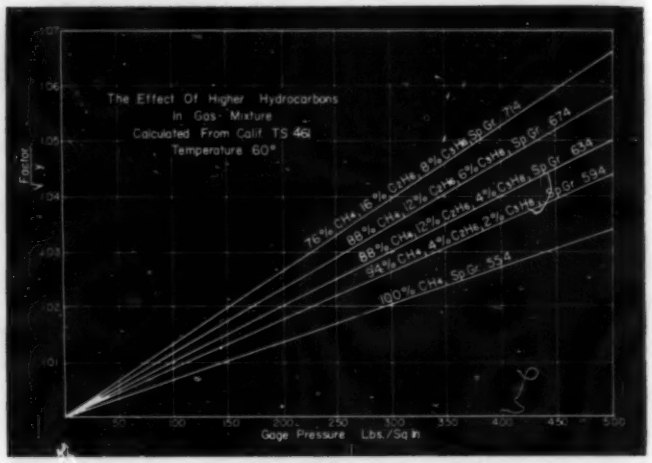

The Effect Of Higher Hydrocarbons
in Gas Mixture
Calculated From Calif TS 461
Temperature 60°
76% CH4, 16% C2H6, 8% C3H8, Sp Gr .714
88% CH4, 12% C2H6, 6% C3H8, Sp Gr .674
94% CH4, 4% C2H6, 2% C3H8, Sp Gr .638
100% CH4, Sp Gr .554
Factor
Gage Pressure Lbs./Sq In

FIGURE 7

cent. There it could be applied to a gas with both diluents being zero. From any pair of CO_2 and N_2 conditions at a specified gravity, two factors F(P) and F(T) are found.

Note that these are not the same as the △ P and △ T found in tables 16-B and 16-C of Report 3. The latter are algebraically added to the pressure and temperature conditions before entering table 16-A (the 0.6 SG base table). In volume seven, these are multiplying factors instead of additive numbers. For a gas of .666 SG, with 8.5 percent N_2 and 0.5 percent CO_2, on the pages of .663 to .667 Sp. Gr., in the columns for 8.4 percent N_2 and 0.4 percent CO_2 (the next lower tabulated) would be found a value of F(P) = 1.0215 and F(T) = 1.0045. These multiplying factors would be used on any gage pressure and absolute temperature conditions of that gas.

To find the Fpv for 500 psig and 50° F., pressure 500 is multiplied by 1.0215 to give 510.75. As absolute temperature must be used, 460 is added to 50 giving 510, then 510 is multiplied by 1.0045. From the product 512.30, 460 is subtracted to give a corrected °F. temperature of 52.30. Now the Fpv tables in the second half of the volume can be entered. Using 510 and 52, Fpv is found to be equal to 1.0452.

All material in Volume 7 uses only the original tables 16-A, 16-B and 16-C. Although it might seem easier to get the data necessary to use 16-D and 16-E (the heating value method), the only way to use that data is as outlined in Report 3, which calls for laborious interpolation.

Also note the definite limit of CO_2 and N_2 percentage. The CO_2 limit will not be bothersome in this area, although some California and Texas gas runs high in CO_2. But many wells are found in the area with over 12 percent N_2. The only choice in this case would be to use the California method of CNGA Bulletin TS 461, graphing down from its lower tabular limit of 500 psig, or to test by a Bean or Burnett apparatus. Note again that TS 461 is the only CNGA publication that recognizes nitrogen and carbon dioxide corrections.

From mass spectrometer analysis, a large number of supercompressibility curves have been calculated. As mentioned later in this article, the practice is to plot Fpv value at 500 psig and at whatever range of temperature is applicable, usually in 10° F. steps. Usually where calculated at 500 pounds, CNGA gives a slightly higher value than AGA, but not always. (See Figures 2, 3 and 4.) Both answers are well within commercial tolerances.

Using the long form of original Report 3 or the short form of Volume 7 seems to give identical answers, differing not over 5 in the fifth place. Since each pair of pressure-temperature values takes nearly 10 minutes to calculate by the long form (because of many interpolations); the short method is at least five times faster.

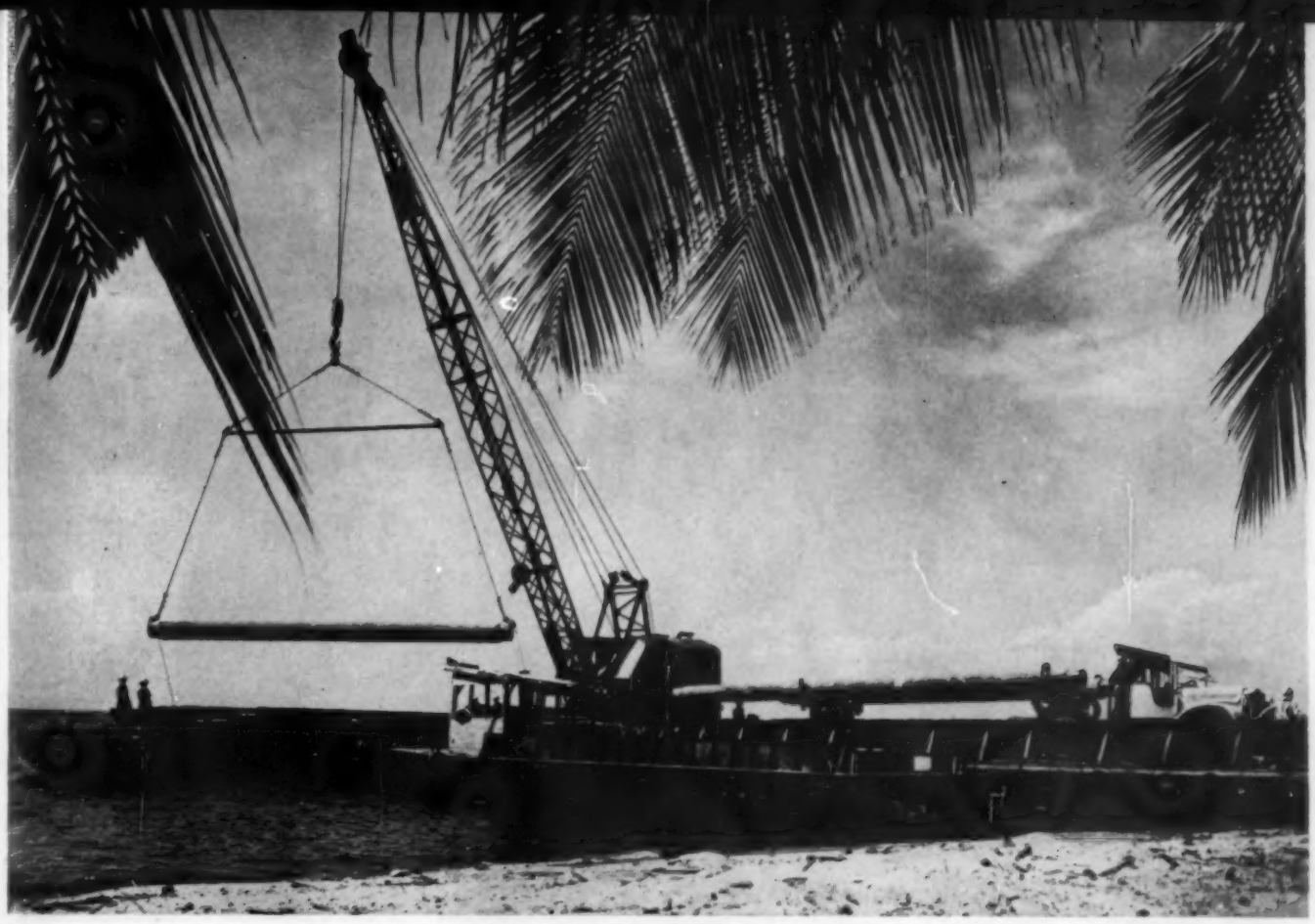
Northern Natural Gas Company believes that curves are easiest to use and apply. Whether data come from actual test or from a calculation, the results are plotted. It is a very important concept that all three calculation methods are merely rearrangements of data that originally came from tests performed on Bean, Beckman or Burnett apparatus.

It has been generally accepted that Fpv plots a straight line at pressures below 500 psig, at each temperature considered. At 500 pounds the Fpv factor for a given range of temperature is calculated either from one of the methods mentioned or plot curves from actual test data. These points are joined to the origin by a straight line, giving a range of pressures from 0-500 psig which is well within accepted tolerances. Chart calculators obtain the Fpv factors from these curves, entering the value on the chart. This is considered much more accurate than using the tables which ignore diluents, and more practical than trying to make a correction for each set of conditions as needed.

When conditions remain essentially constant, as in town border sales, this same method is used but the Fpv factor is included in the basic coefficient C′. Since daily charts are usually used this is more practical. The gas actually is tested on Bean or Burnett apparatus each quarter or oftener, and the basic coefficient refigured each 30 days or oftener. In either case the Fpv factor is one multiplier in the series of factors which when multiplied together gives the volume of gas in Mcf represented by each individual orifice meter chart.

Northern Natural owns and has in operation one Bean and two Burnett apparatus for direct test. To obtain the analysis needed for calculation both a fractional distillation apparatus and a mass spectrometer are operated. It is not easy to obtain these factors accurately, but since error in omission or misuse is great, expense and effort in this phase of gas measurement is felt to be justified.

—The End



1. Loading 40-foot lengths of 16-inch pipe for the submarine line at La Ensenada, for transport to the laying barge.

2. Pipe lengths arrive at barge ready for laying, except for joint ends. Concrete covering neutralizes buoyancy, resists marine borers.

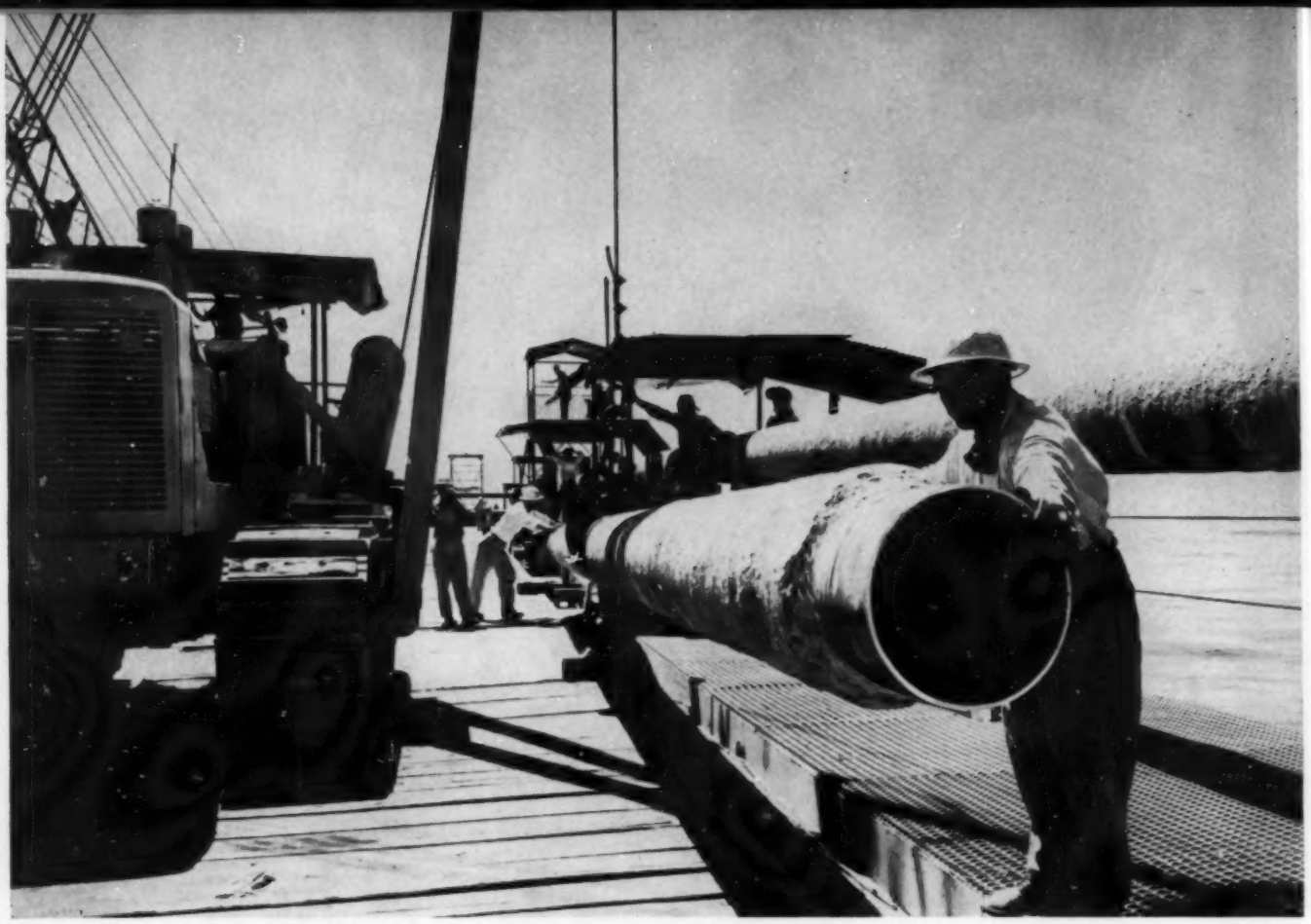
A PICTURE STORY OF

SHELL'S "LAPLINE"

45-mile long pipe line from beneath the waters of vast Lake Maracaibo

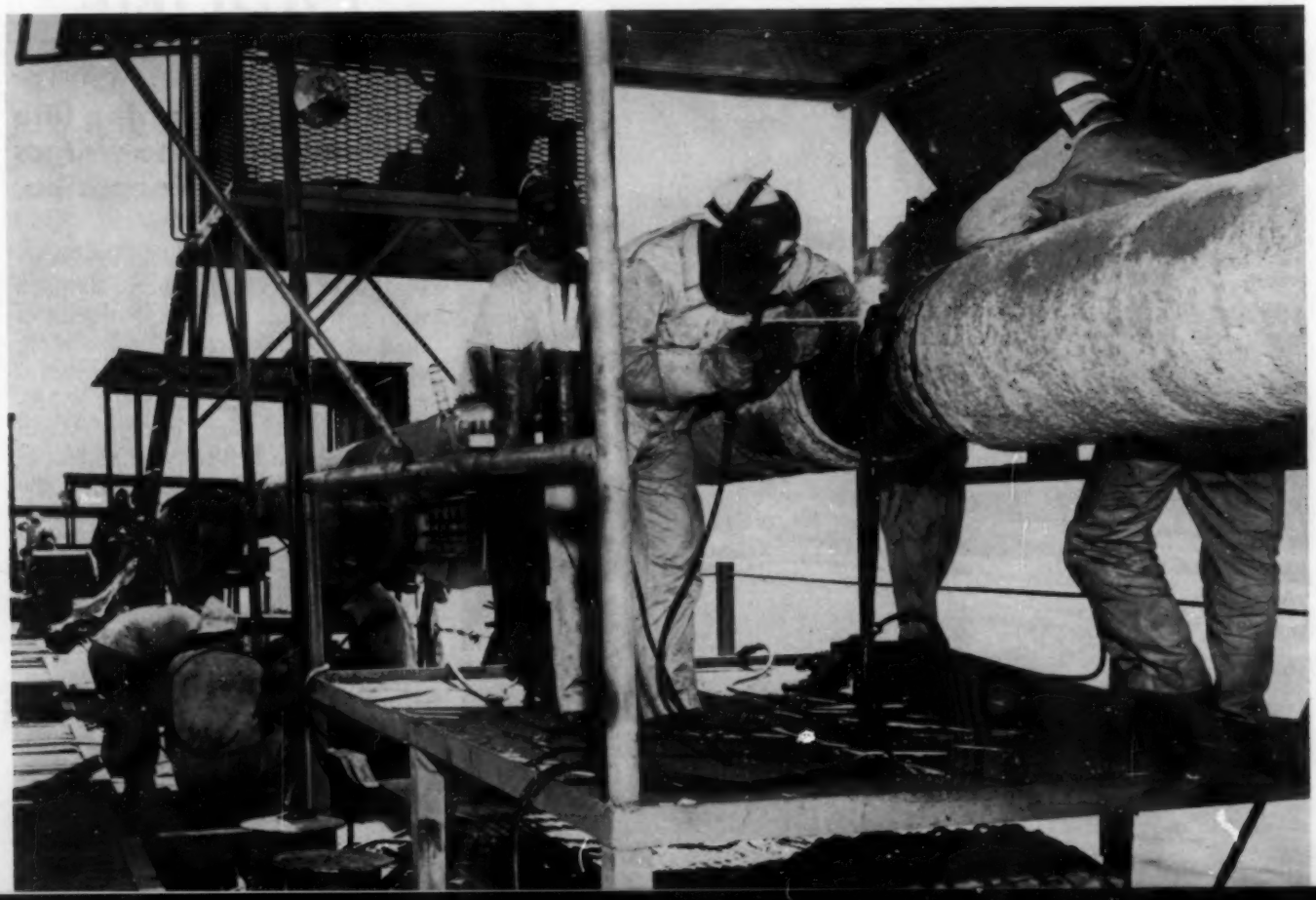
MANY PROBLEMS arise in the ceaseless job of keeping the world supplied with petroleum products. Not least of these is the transporting of crude oil, often in the face of severe geographical obstacles, from the wells to refineries or shipping centers. When those wells lie beneath the waters of Venezuela's vast Lake Maracaibo, the transportation problem is particularly difficult.

Until recently small tankers were used by Compania Shell de Venezuela to move its lake production to shore installations. These have now been replaced with the "Lapline"—a 45-mile long pipe line—which carries oil from the lake wells to Shell's shore



3. On the laying barge assembly-line technique is adopted. The pipe lengths are lined up ready for welding . . .

4. Tie-in weld is made and welded section is moved to other work bays for filling in, X-ray checking, final covering of joint ends.

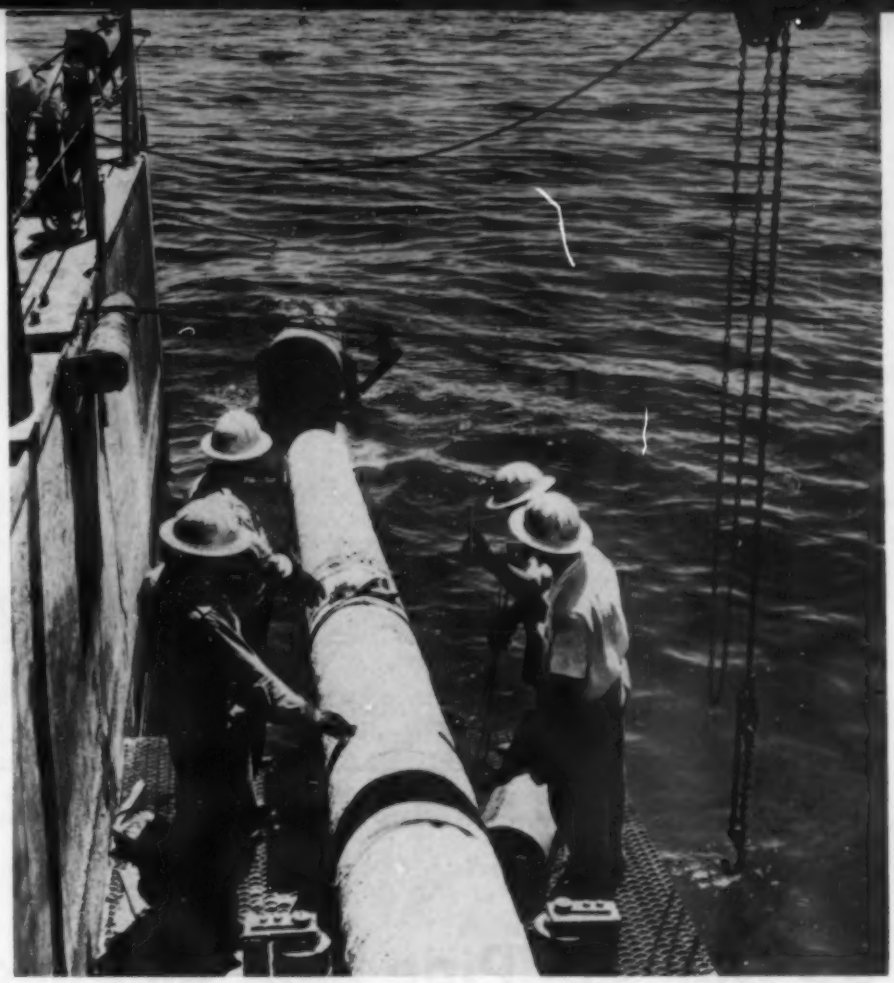


loading terminal at Palmarejo, on the west side of Lake Maracaibo.

The new pipe line is in two sections. From a platform set up in 70 feet of water, its submarine section, which is connected to the underwater gathering lines from the wells, extends shoreward 18½ miles. It emerges at La Ensenada to connect with the land section which continues for 26½ miles to Palmarejo.

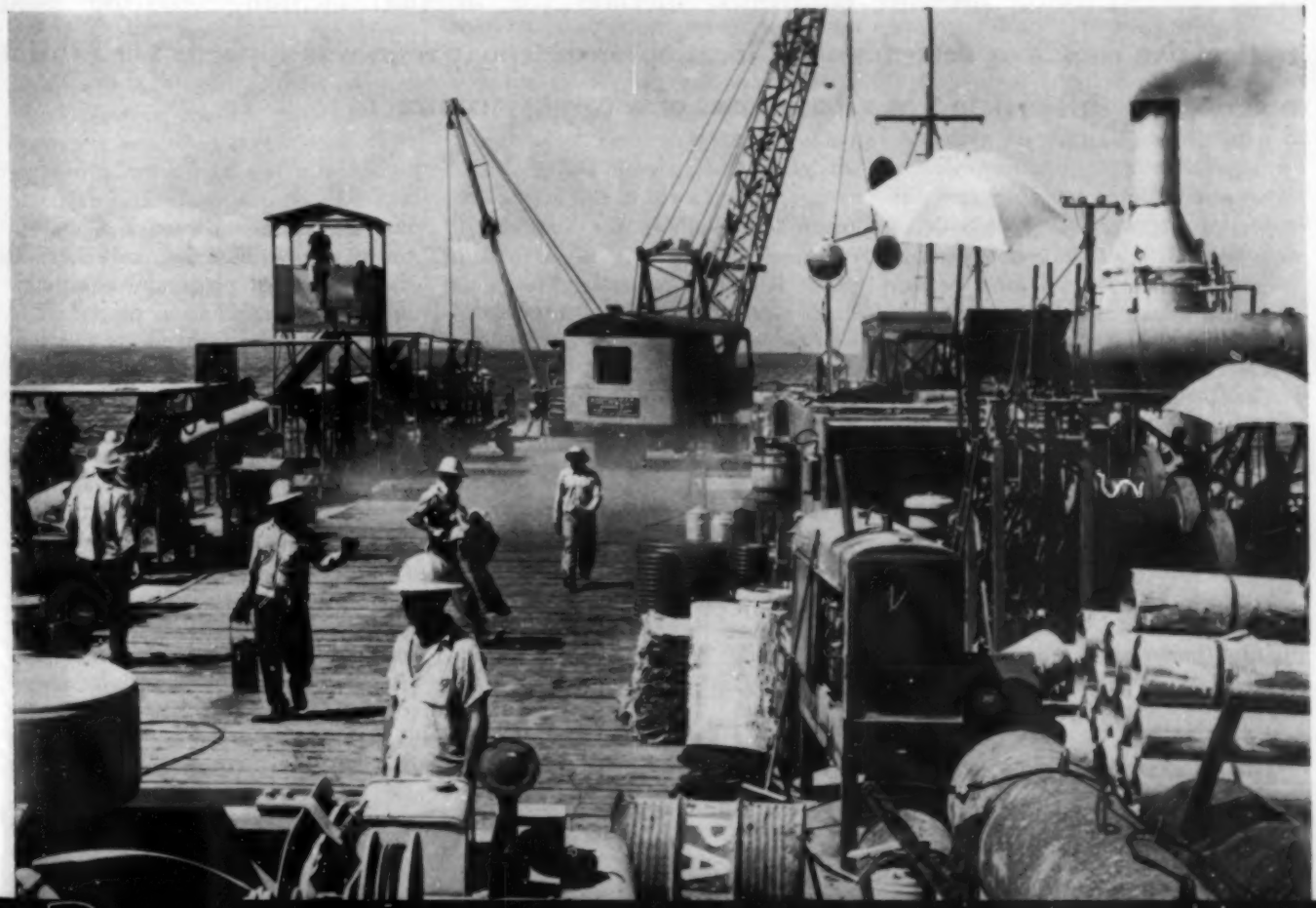
Costing some $7 million to build, the Lapline can carry up to 100,000 barrels of crude oil daily to the loading terminal, which has been enlarged to deal with the increased intake made possible by the pipe line. Much of this is processed at Shell's Cardon plant on the Paraguana Peninsula, where the largest refinery in South America is located.

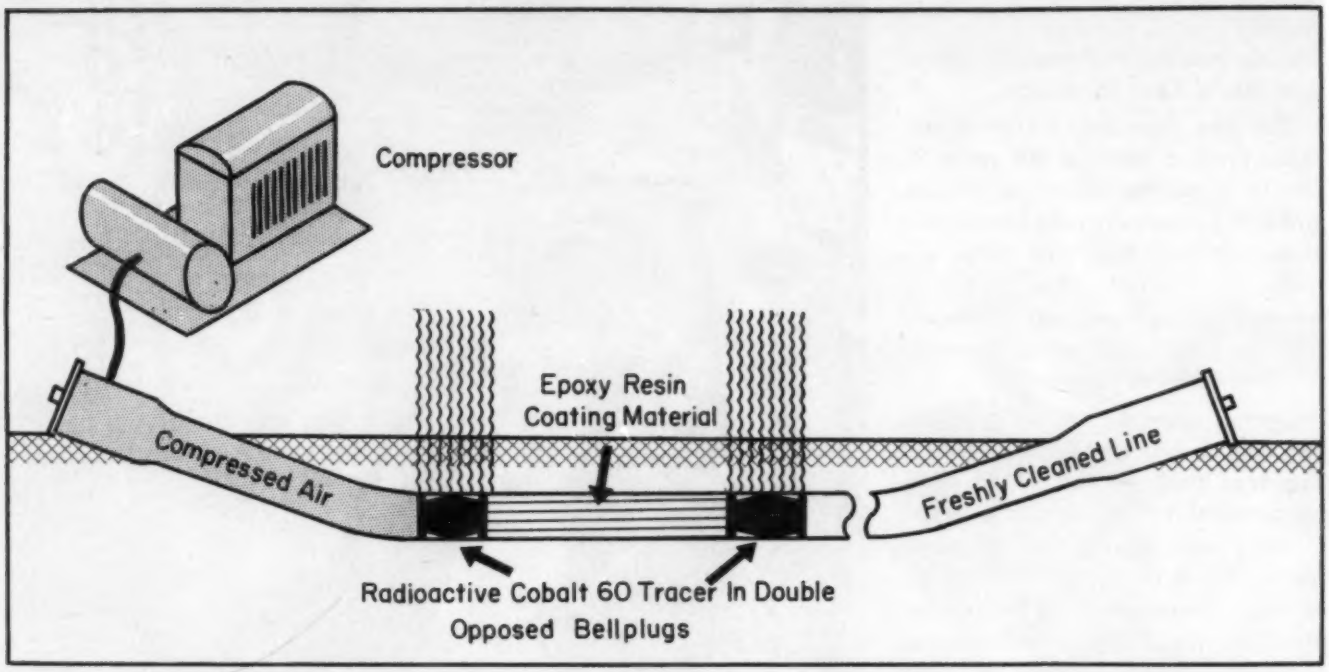
Construction of the submarine section of the line was handled by Brown & Root. —The End



5. Lowering submarine line into water. Pontoons control buoyancy, prevent damage, undue stress; are released when line settles on lake floor.

6. Deck of laying barge during operations. Submarine line was completed in 77 days. One thousand and five hundred feet of pipe was a normal day's lay.





Artist's idea of the technique used in coating pipe lines internally in place using opposed bellplugs containing a radioactive cobalt tracer.

Progress and relative position of the plugs may be observed by radiation monitoring instruments carried along the line above ground.

35 Miles of Pipe Line Cleaned and Coated in Place in One Operation

Unique pressure-controlled method for internal cleaning, coating used radioactive cobalt to determine pig location as the epoxy resin was applied. The project described in this article was a basic part of a turnkey contract.

A NEW CHAPTER in the history of pipe line coating has been written in West Texas where 35.5 miles of second class 8-inch and 10-inch line has been cleaned and coated in place as a combination unit.

The project was unusual in that provision for internal cleaning and coating of the entire line was a basic part of the turnkey construction contract for a major pipe line company. The location is in Andrews and Ector counties.

Internal Pipeline Maintenance Company handled this project, longest such undertaking ever attempted. The work was performed for a large pipe line company, operating in Texas and New Mexico.

This process is a unique pressure controlled method for internally cleaning and coating pipe lines in place. It provides extended life for the line, guarantees trouble-free operation, increases economy by reducing friction in the line. It can be accomplished in a fraction of the time of digging up the pipe and working on individual lengths.

The project just completed started at a field station 11 miles northeast of Andrews in northeastern Andrews County. The first 17½ miles of this main line project is 8-inch pipe and 10-inch pipe is used for the remaining 18 miles to a trunk line station, 16 miles northwest of Odessa in Ector County.

A recent innovation which helps increase efficiency of the operation is the use of a radioactive Cobalt-60 source to provide a means of checking the location of plugs and equipment moving through buried pipe.

Another advancement in this type operation was introduced on the project as a means of cutting waste of costly coating material. The line was opened at a midpoint on each main section to permit a check of coating material applied to that point. The plastic material is an epoxy base, amine cured, catalytic setting resin.

Keys to the process are large volumes of compressed air and double opposed bell plugs. Compressed air, provided with heavy duty compressors, is utilized to force the plugs or pigs through the line to wash or coat the interior with solvents, cleaning

Start of operation finds maintenance crew setting up with materials including air compressors, waste, steel cuttings, plastic material, even a radio tower to provide two-way contact with other personnel in the area. Background shows a field tank, holding oil for the line.

material, diluents or various types of coatings.

"Batches" of liquid—cleaners or coatings—are placed in the line between two air tight plugs. With the progress of these plugs through the line carefully controlled by differential pressures against both leading and trailing plugs, the thoroughness of cleaning and uniformity of coating can be closely governed.

Solvents, coatings and plugs are placed in the line at an open end where the pipe is exposed to the atmosphere. A specially designed pup joint is rigged on the pipe at both upstream and downstream ends. The joint provides a means of introducing materials and plugs into the line and a means of introducing air into the line. The pup joint also has provision for bleeding pressure.

The first step in this operation was the placement of pup joints at each end of the 17.5 and 18-mile sections. Next came "popping the line," the process of building up air pressure and then opening the downstream pup joint. Air, fluid and pieces of dirt and other foreign material roared from the line with the sound of a gun.

Each pup joint is a hollow loading barrel with various fittings, gauges, valves and connections. It has a special patented, circular door, hinged below and latched securely. A set screw in the middle of the door forces a neoprene gasket against the rim of the barrel, making a pressure tight seal. The latch has an extended tripping arm so that an operator can "pop" the line without danger of being hit by anything shooting out of the opening.

The line was popped several times with air to clean out loose materials. Next, the operators washed the line with water to remove any water soluble materials. The first real cleaning operation included the forcing of wads of steel lathe cuttings and burlap and waste through the line with an air-driven plug. It required approximately 50 minutes to build up to the popping point. When the line was popped, cuttings and rag waste, air, fluid and debris roared from the end of the line, with some of the cuttings and burlap deposited 300 feet away.

This was repeated until the waste came out as clean as when it went in.

The final run of plugs through the line was with the necessary batch of the plastic coating material. This was the most critical part of the operation since the placement of this continuous barrier of impregnable material must be applied to the entire interior of the pipe. Forty-four hundred gallons of liquid plastic were introduced into the two lines. Engineers had carefully computed the amount of plastic required to insure a coating of proper thickness for the entire 17.5 and 18-mile sections.

Popping the line with air was done several times. Then line was washed and air-driven plug forced steel lathe cuttings through it.

After application and the initial drying phases the plastic continues to harden for seven days, gaining bond and strength, an advantage similar to the slow airing of concrete. The coating was designed to offer in a single liquid material the bonding, hardening, corrosion resistance and friction-free surface so essential to the effective coating of line pipe.

Use of a coating which requires only one application provides significant economy in the operation and permits the line to be placed in service much sooner than in cases where repeated trips must be made with primer, intermediate and final coats.

The cleaning and coating of pipe lines in place is becoming one of the key factors in industry's fight with the costly problem of internal corrosion. The history of these operations and the reports of trouble-free operation of lines so serviced proves the effectiveness and economy of such projects.

—The End

HOW TO DO IT

Improve the Operation of Pressure Gages

Rules to follow in the maintenance and calibration of the instrument that is vital to the accurate measurement of gas. Here are four basic rules.

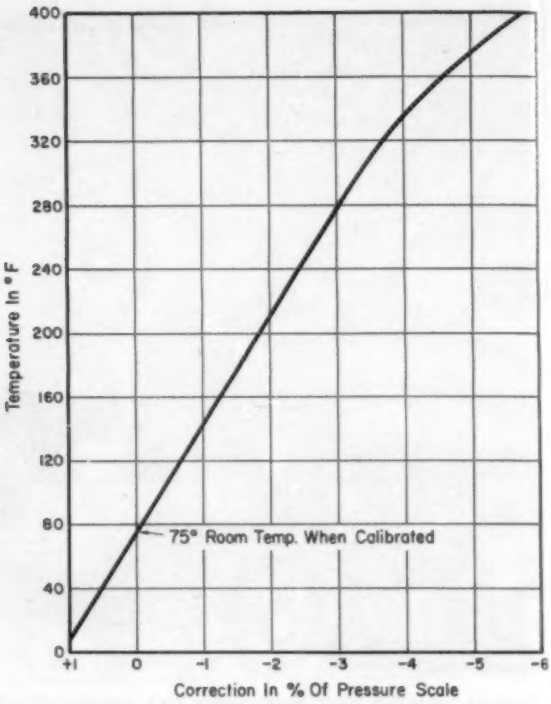


FIGURE 1—Approximate error or change in calibration of a Bourdon tube type pressure gage caused by changes in temperature. Example: Gage working at 500 psi pressure and at 280° F. temperature would have a —3% correction and would read 3 percent or 15 psi high.

By OLIVER L. CLAY,
Manning, Maxwell & Moore, Inc., Tulsa, Okla.

Pressure gages—simple but vitally important instruments in the measurement of gas—will perform better and longer if four basic rules are followed.

1. Select a gage with proper range and Bourdon tube material for type of service.
2. See that the gage is installed properly.
3. See that periodic maintenance is performed.
4. See that periodic calibration checks are made.

If these four steps are followed, more accurate pressure indication will result.

Selection. Gages should be graduated to about double the average working pressure, selecting the nearest standard range. This will make the gage last longer and the pointer easier to read at about the top center of the dial.

Get the right gage for the job. Use gages of the proper Bourdon tube material and with correct joints for the service.

Installation. Always use a wrench on the square shank on the gage socket to screw the gage in place. When a fitting is being screwed to the gage, hold a wrench on the socket flats instead of twisting against the gage socket screws which are intended to hold the gage mechanism in the case.

When gages are mounted on a wall or panel, make sure they are connected free from piping strains. Also see that the mounting surface is flat or insert washers under the flange of the gage case to obtain three-point suspension. Preferably, the last length of piping leading up to the gage should be flexible tubing. This will insure that the gage is free from strain.

Install gages where they will be free from the effects of mechanical vibration as this will wear out any gage quickly. Try to mount the gage on a wall nearby and connect the gage to any machine which vibrates badly by means of flexible tubing.

Protect gages from frequent pressure pulsations by using throttle screws in the socket of the gage, needle valves, pulsation dampeners, or gage savers.

Locate gages where they will not be subject to high heat which will weaken soldered tube joints. High temperatures, also, make gages inaccurate. See Figure 1. Install gages where they will be free from moisture and corrosive fumes, if possible. If these conditions are unavoidable, ask for special recommendations and, in general, use phenol plastic cases which are resistant to most corrosive fumes and will not rust.

Maintenance. Apply pressure slowly. Do not open the gage cock or valve too quickly. This imparts a severe strain on the Bourdon tube which may rupture it, or at best result in shortened life. When the service itself is subject to sudden pressure variations, use a needle valve, or gage saver.

Avoid over-pressure. See that the apparatus is provided with a relief valve and that the range of the gage is higher than the set pressure of the relief valve.

Sudden pressure release has the same detrimental effect and should be compensated for in the same manner as for pressure applications mentioned above. Replace broken glasses and thus keep dirt out of the working

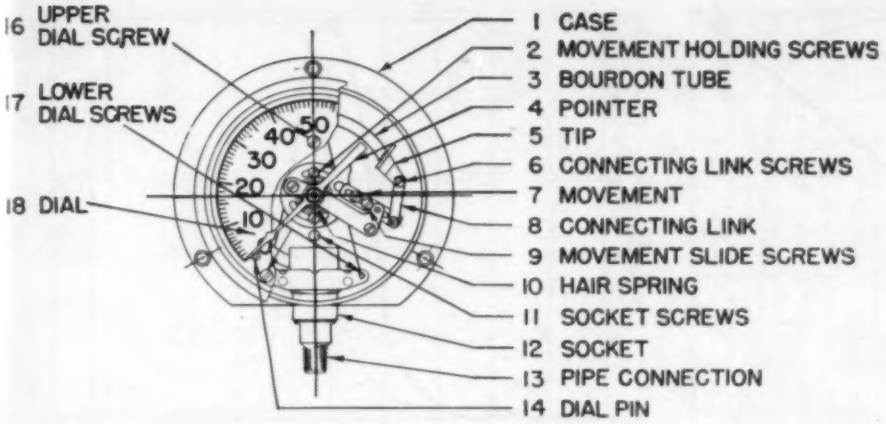


FIGURE 2—The socket, tube and tip assembly (12, 3, 5) is furnished as one integral unit. The movement (7) is supplied complete, although hair springs (10) may be ordered separately. Rarely will modern parts fit in old style gages.

bearings and teeth of the movement mechanism.

For many years, all gage manufacturers have recommended that movements should not be oiled. There were two reasons for this. The first was that oil naturally attracts dust and therefore, cause more trouble than not using oil. The second reason was that, unless a high grade instrument oil was used, the oil had a tendency to gum up.

Most cases on gages are reasonably dust-proof. The use of a good grade of instrument oil to prevent rusting and to resist wear is frequently very beneficial for all-metal movements, (stainless steel or bronze).

With reference to Figure 2, the two pinion bearings, the two segment shaft bearings, the pinion and gear teeth, and the two connecting link screw bearings should be lightly oiled, using a toothpick or other small object for oiling.

The use of oil is not desirable on nylon movements. For these, a light viscosity silicone fluid may be applied in the same manner as instrument oil is used on all-metal movements.

Silicone fluid, of a high viscosity, may be applied to the pinion and segment teeth of any type of movement to overcome the whipping of the pointer on rapid pulsation or vibration service. Such silicone fluid does not have good lubricity and, therefore, should not be used to combat wear.

However, when applied to a movement and linkage, it prevents the pulsation of the pointer, and at the same time it has extreme "slipperiness" which permits accurate indication of the pointer. In order to apply this high viscosity silicone fluid to a movement and linkage, it should be diluted with carbon tetrachloride, benzene or xylol, to make it more fluid while it is being applied.

However, the carbon tetrachloride, benzene or xylol quickly evaporates and leaves behind the full dampening effect of the silicone fluid. Put the diluted silicone fluid into a hypodermic needle syringe and apply very small amounts to the movement, linkage, and teeth.

It is not recommended that this high viscosity silicone fluid be used as a means of resisting wear, but only as a means to overcome whipping of the pointer on rapid pulsation service, or vibration which could otherwise result in, and promote wear.

Calibration. Adjusting a gage is a broad term and will be divided into specific classes.

FIGURE 3—Adjustment of gages having rotary geared movements.

1. Calibration correction by resetting the hand, or by adjusting the micrometer pointer to agree with some desired standard. To do this, the ring with glass must be removed and the pointer or hand brought to the nearest agreement over the desired range.
2. If this simple adjustment is not sufficient to give the desired accuracy, the cause should be determined, such as, sticky or sluggish action throughout the scale or at some points; or the pointer travels too fast or too slow throughout the whole scale or at either end of the scale.
3. To correct for sluggishness, clean all bearings and gear teeth. Hair spring should be adjusted so that all back lash is eliminated; keeping in mind that too much tension will cause friction and drag.
4. The slide "S" moved in or out (see Figure 3) changes the ratio of motion. A Bourdon tube may change slightly so that its motion under a given internal pressure is either more or less; therefore, the slide "S" is moved to compensate or agree with the Bourdon tube's motion. When the pointer moves too fast, the slide "S" should be pushed out; if the pointer moves too slow, the slide should be pushed in. When properly set, tighten slide screws.
5. Even with the slide set to the best location, it is necessary to have the angle of pull "A" just right, or the pointer will travel too fast at either the low or high end of the scale. By loosening screws "M," the whole movement may be rotated to give the desired angle "A." If angle "A" is acute, the pointer will travel fast on the first part of the scale and slower on the last part.

For example, a gage may read perfectly from zero to the top of the dial, or one-half of the scale, and from there on go gradually slower. In this case, increase the angle "A" a little at a time until the hand begins to go faster for the last half of the scale. "A" = 76° approximately. When a new movement is being adjusted to an old gage, this rotary feature is extremely convenient.

ACKNOWLEDGMENT
Presented at the Southwestern Gas Measurement Short Course, University of Oklahoma, Norman, Okla.

—The End

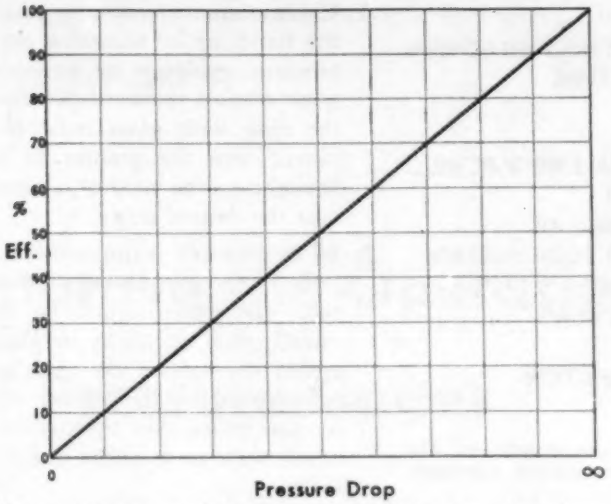


FIGURE 1—Attenuating characteristics of resistive type dampeners.

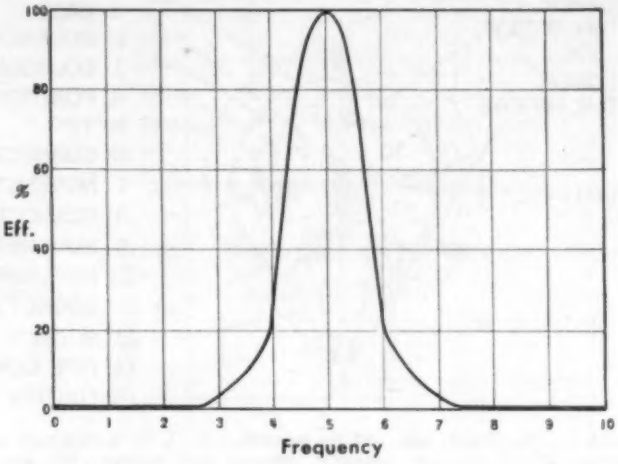


FIGURE 2—Attenuating characteristics of resonator type reactive dampeners.

How to Control Piping System Pulsations

Here is a summary of pulsation dampening today.

By N. H. MOERKE, The Fluor Corporation, Paola, Kansas
and **C. NEWMAN,** The Fluor Corporation, Whittier, Calif.

THE MAGNITUDES of gas-pulsation problems are difficult to predict before a compressor plant is placed in operation. In many cases, otherwise well-designed plants have received unfavorable criticism from operators and management because of operating difficulties caused by the presence of excessive gas pulsations under actual operating conditions. However, through the diligent use of dynamic relationships[1] in the design of compressor-plant piping and pulsation-dampening equipment, the problems attributed to gas pulsations can be minimized.

There are two basic ways of controlling these gas pulsations:

Resistive. Methods whose efficiency is a function of pressure drop and which consist of a reduction in area of the flow path by means such as orifice plates and valves.

Reactive. Methods whose efficiency is a function of frequency and which consist of properly designed changes in pipe sections and internals such as low or high pass dampeners.

Resistive Types. These methods of controlling gas pulsations have been used in the past and are found occasionally in present day plants in the form of orifice plates and pinched valves. However, the general use of this type of control is not recommended unless it is designed for a specific purpose as it has certain disadvantages which override its advantages of low initial cost and small physical size.

These disadvantages are that its efficiency is a function of the gas-pulsation amplitude, with generally low efficiency and high resistance to flow, or high pressure drop. A graph is presented, Figure 1, which shows a typical curve for efficiency versus pulse pressure for this type of control method on gas pulsations.

TABLE 1

Type Dampener	Advantages	Disadvantages
Resistive	Essentially insensitive to frequency	Low efficiency High pressure drop
Resonator	Negligible pressure drop High efficiency	Limited frequency range Limited configurations Requires constant speed operation
High Pass	Low pressure drop High efficiency Wide frequency range	Passes high frequencies Recurrent dampener Limited configurations
Low Pass	Low pressure drop Wide frequency range High efficiency Adaptable to many configurations	Passes low frequencies Recurrent dampener

The simplest form for this control device is a valve placed in the system at the point which requires control. The more elaborate form, which requires a knowledge of design, is the placing of an orifice within a volume chamber.

Reactive Types. These methods of controlling gas pulsations are presently in use on systems where reciprocating compressors are used to compress and transport gas. The basic reactive type dampener is used in three major ways as (1) side-branch resonators, (2) high-pass dampeners, and (3) low-pass dampeners.

Side-branch resonators are absorption devices which give negligible pressure drop to the system, but have a limited frequency range and can be used to advantage on essentially constant speed compressors. Figure 2 is the characteristic attenuation curve for this type of pulsation control.

The forms of this type of control device are composed of volume chambers and orifice plates, volume chambers and pipe lengths, or just pipe lengths all of which can be attached to the laterals, headers or normal

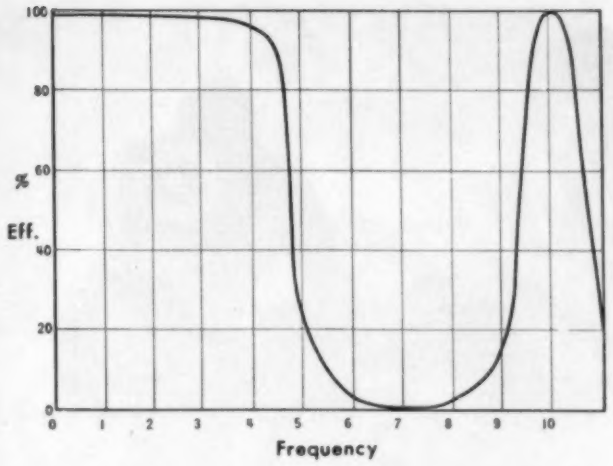


FIGURE 3—Attenuating characteristics of high pass reactive dampeners.

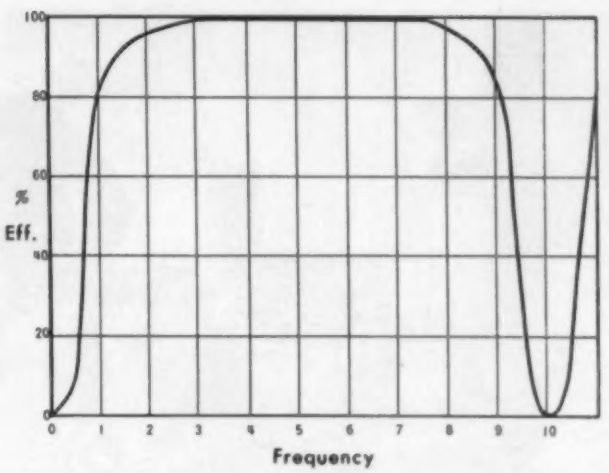


FIGURE 4—Attenuating characteristics of low pass reactive dampeners.

surge chambers of the compressors at a side branch.

High-pass dampeners are dampeners which allow passage of the high frequencies and attenuate the low frequencies. They can be designed to have low pressure drop with high attenuation characteristics for pulsation control. Figure 3 shows a typical curve for efficiency versus frequency for this type of control method. In order to show the recurrent characteristic, the curve is drawn arbitrarily showing a recurring attenuation peak at ten cycles. This recurrent characteristic is a function of the physical geometry of the dampener.

The forms of this type of control device are composed of a length of perforated pipe and external shell which can be inserted in the lateral (in-line dampener) or replace the normal volume (manifold dampener) bottle of the compressor.

Low-pass dampeners are dampeners which allow passage of the low frequencies and attenuate the high frequencies. These also can be designed for low pressure drop with high attenuation characteristics for pulsation control. Figure 4 shows a typical curve for efficiency versus frequency for this type of control method. In order to show the recurrent characteristic, the curve is drawn arbitrarily showing a pass frequency at ten cycles. This recurrent characteristic is a function of the physical geometry of the dampener.

The forms of this type of control device are composed of two chambers and interconnecting pipe and can be adapted to almost any configuration. The manifold configuration is designed so that one chamber of the dampener is used as the volume bottle for the compressor cylinder, thereby, replacing the normal volume bottle; the in-line dampener consists of an elongated shell which is divided into multiple chambers with appropriate interconnecting tubes and is inserted in the lateral piping as close to the compressor as possible; the two-bottle dampener consists of two separate chambers which are connected by a properly sized interconnecting tube with one chamber used as the manifold volume bottle while the second chamber is inserted in the lateral. The dampening system, which considers the complete plant piping between the compressor cylinders and header system as a pulsation dampener, requires the proper relationships between volume bottles, headers and lateral piping.

Characteristics of Control Methods. Table 1 is a tabulation of the general characteristics of the various methods of controlling pulsations. Each method has a definite use dependent upon the existing circumstances surrounding the pulsation problem. The high-pass and low-pass dampeners have the wider utility with the low-pass dampener being the more adaptable to various design situations. Figures 3 and 4 show more clearly the recurrent characteristic which is tabulated as a disadvantage in Table 1. This recurrent characteristic is a function of the geometry of the dampener, and its magnitude and frequency is not always predictable by simplified theories.

Residual-Pulsation Limits. Invariably during conversations or discussions regarding control of pulsations, someone will ask the question, "How much control or damping is required to prevent vibration or metering errors?" This question is difficult to answer specifically as each type plant is different slightly in design as to compressors, piping, etc. However, some general areas of acceptable residual-pulse pressures can be ascertained.

For plants where vibration is an expected or a prevalent problem, the areas fall into two categories dependent upon the basic plant design. In plants which follow the pattern of grade-type piping and which are well designed in accordance with dynamic relations for structural supports, 1¼ percent (½ peak to peak) of average pressure is acceptable. Where plant design follows the pattern of overhead-type piping, there is more room for errors in dynamic relations of the structural supports so we have two regions of acceptability: 1¼ to ¾ percent (½ peak to peak) of average pressure for well designed and ¾ to ½ percent (½ peak to peak) of average pressure for average design.

For plants where metering problems exist or are expected, the maximum residual-pulse pressure ranges from ¼ to 1/10 percent (½ peak to peak) of average pressure and is dependent upon type and range of the meter and its position in relation to compressors.

REFERENCE

1 "Correction and Prevention of Engine Piping Vibrations," by N. H. Moerke and C. Newman, Proceedings, 28th Annual Fall Meeting of the California Natural Gas Association, October 8-9, 1953, pp. 37-46.

ACKNOWLEDGMENT

Abstracted from a paper presented at the ASME meeting in New Orleans, Sept. 25-28, 1955.

Installation of new lube oil flow meter on compressor at United Gas' Napoleonville station.

United Gas' Turbine Station Runs Into 'Bugs'—Louisiana Cane Bugs

But first major checkup of two-year old centrifugal installation at Napoleonville finds it void of operating bugs.

NAPOLEONVILLE STATION, first and only turbine-driven centrifugal compressor installation in the United Gas system, is back on stream after a three-week shutdown for its first major inspection since starting operation in November, 1953.

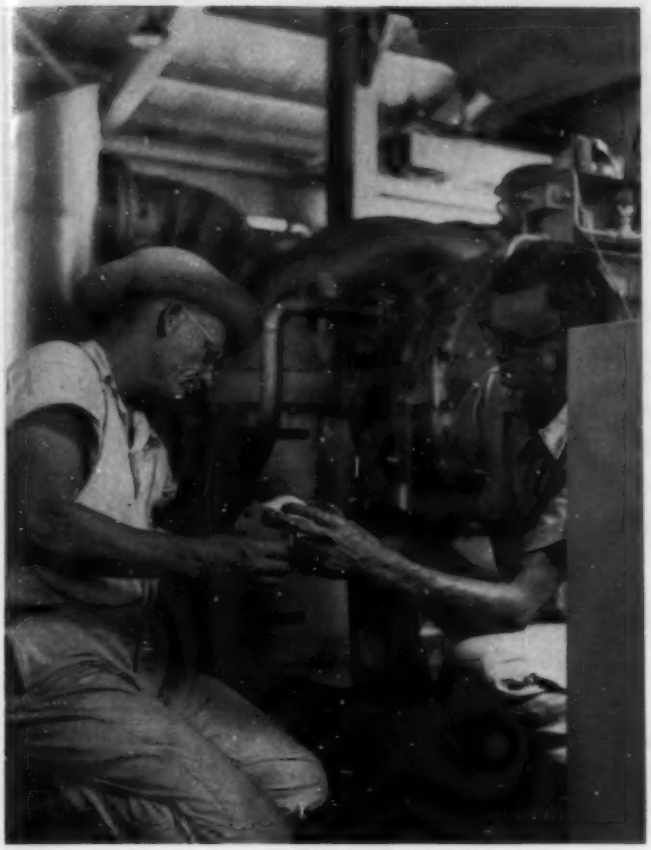
Chief Engineer Louis C. Woerndel turned the control switch to initiate the automatic starting sequence that placed the station back in service pushing gas from south Louisiana and offshore fields northward through UGPL's 30-inch pipe line to Kosciusko, Miss.

It had been out of service for a thorough "look-see" inside the turbine and compressor to ascertain what effect, if any, the intense heat (up to 1450° F.) within the unit had had on working parts, and to observe its over-all condition.

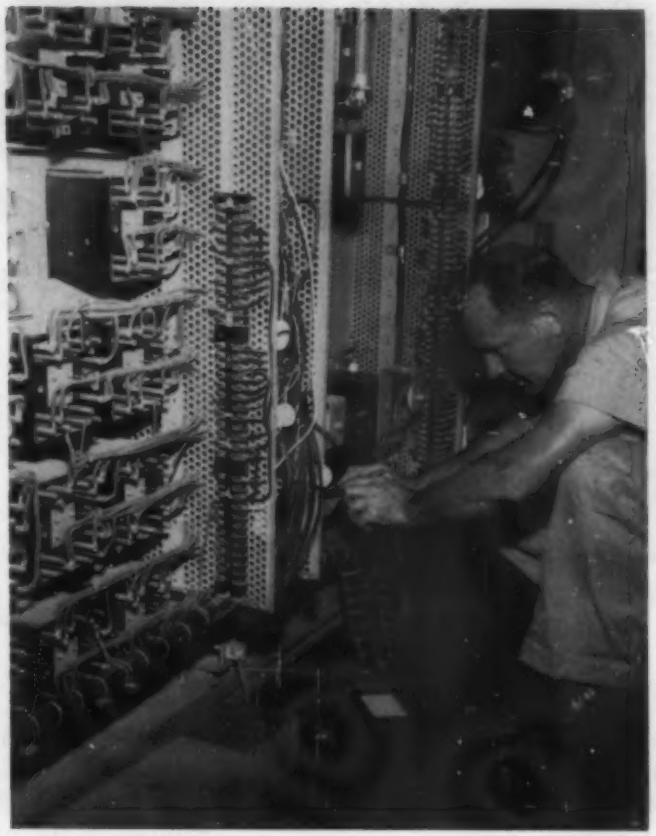
Up to the day of the shutdown, Napoleonville had logged 13,395 operating hours since it was put on the line in 1953. From December 30, 1954, to May 3, 1955, the station was not shut down a single time—logging over four months of continuous, 24-hour a day operation. During the period it boosted an average of approximately 525 million cubic feet of natural gas per day.

Equipment manufacturers recommend major inspections of turbine-driven installations for every 8000 to 24,000 hours operation, and minor inspections for every 5000 to 10,000 hours. Napoleonville got its first minor check in 1954. In August, however, practically the entire turbine and compressor assembly was dismantled for a complete check.

As it turned out, the inspection job did turn up plenty of "bugs," but



Examination of air filter from the turbine assembly by station engineers Sable Bush (left) and V. V. Thompson.

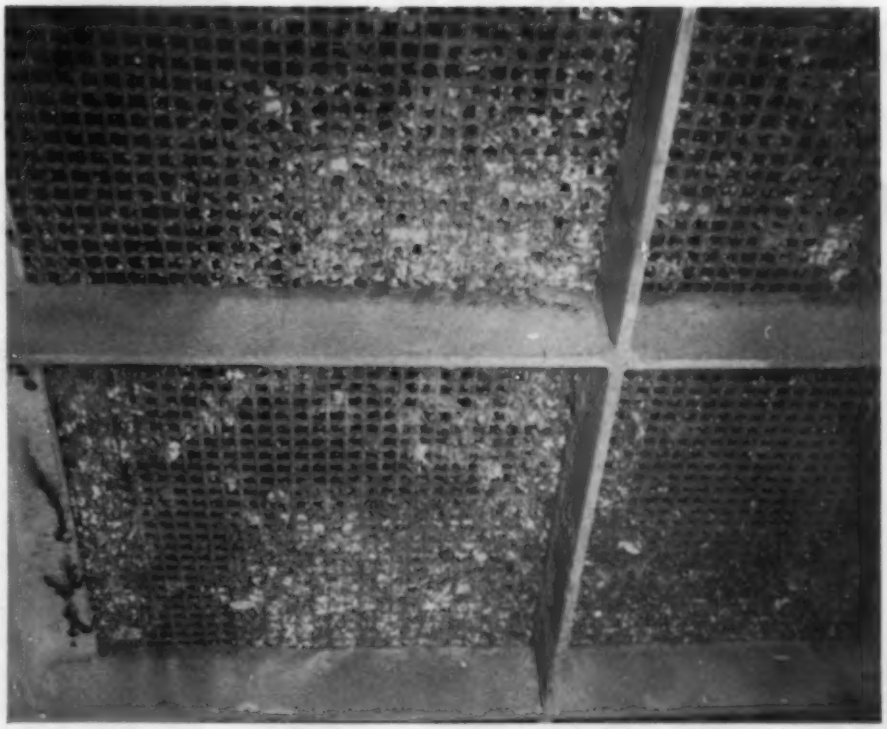


Wiring behind air filter from the turbine assembly is checked by Chief Engineer Louis C. Woerndel.

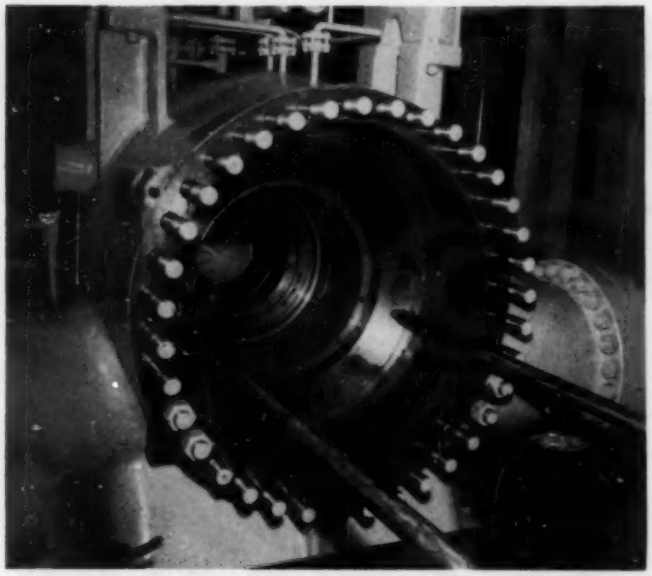
not the type to be confused with operating kinks. They were real bugs—and literally millions of them. They were caked on the screen above the air compressor and in the throat of the air compressor itself. A few traces were even found on the first series of compressor blades.

Napoleonville station is in the center of Assumption Parish in the thick of the south Louisiana cane country, and natives of the area identify the intruders as "cane bugs." They are small, soft-textured insects that thrive in the cane fields. Station employes say their appearance in the area is on a somewhat seasonal basis. They seem to be worse in the spring and summer, and are much more noticeable some days than others.

When the station is running at full load, approximately 113 million standard cubic feet of air per day is compressed and burned with natural gas in the combustion chamber of the turbine to supply the fast-moving stream of hot gases to drive the tur-



Inlet screen adjacent to air compressor looked like this when uncovered. Cane bugs drawn through air intake had caked on screen.



Turbine and compressor were found to be in excellent over-all condition after 13,395 hours of operation. These views show the compressor shell, at left, and the impeller that pushes the gas.

bine wheels. On days and nights when the air is thick with bugs they are drawn into the air intake by the thousands.

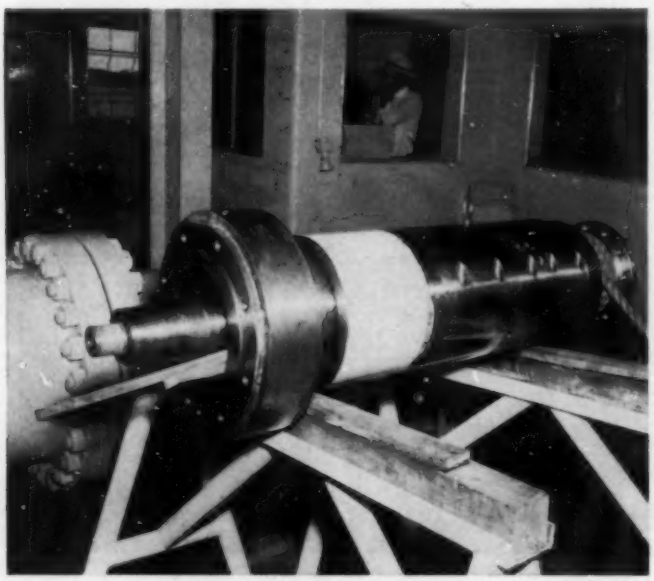
To solve the problem, a new type automatic filter screen was installed over the station air-intake. It is a continuously revolving screen that operates automatically on air differential pressure. When enough bugs collect on the screen to cut down incoming air pressure, the unit increases its speed to roll a clean section of filter over the intake.

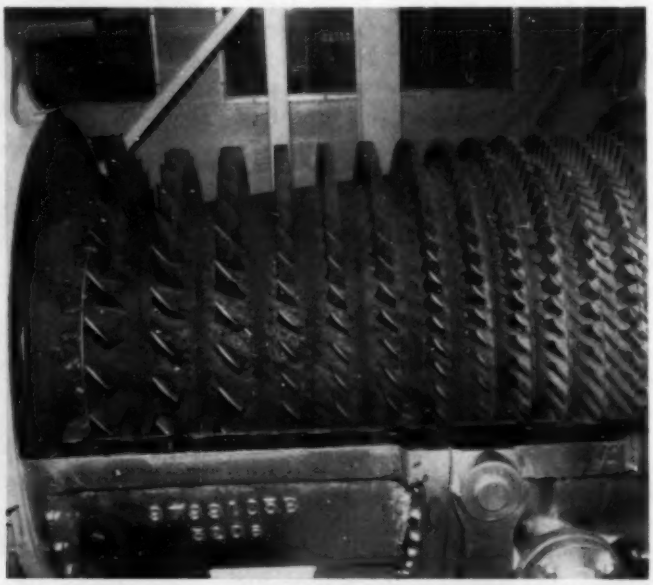
Compressor, Turbine in Excellent Condition. The multitude of real bugs found in the unit was in direct contrast to the scarcity of operating "bugs" or equipment failures uncovered. The unit was found to be in excellent over-all condition.

Visual inspections followed by metal die tests showed no cracked or damaged parts from the terrific heat generated within the turbine. Only a few minor replacements were necessary and these in the immediate vicinity of the combustion chambers where the hot gaseous stream is formed.

Actual dismantling, inspecting and reassembling of the unit required about two weeks. The remainder of the time the station was off the line was utilized in clean-up work, painting and installation of additional lubricating facilities. During the time the station was down, Napoleonville was by-passed and the gas load picked up by Montpelier station, approximately 60 miles upstream on the line.

ACKNOWLEDGMENT
Reprinted from *United Gas Log*, September, 1955.





Here is the compressor shaft assembly minus the impeller, at left, and a view of the 14 stages of blades in air compressor of turbine.

TRACTOR-TYPE CRAWLERS OFFER GREATER MOBILITY TO PIPELINERS

Provide Important Advantages for Traveling Over Rugged and Steep Terrain

Performance reports on 15-B and 22-B excavators equipped with special tractor-type crawlers prove the value of this mounting on pipeline jobs. From New Mexico we've received this typical report:

"The country was rocky and, in places, the hills were so steep that tractor winches were needed both as an anchor in digging, and also to let the backhoes down the slopes when digging was completed. I noticed that the tractor-type treads on the 22-B's allowed them to travel and dig unaided in many places where machines, equipped with conventional treads, were helpless without tractors and winches."

And the ditch foreman on this spread says:

"Bucyrus-Erie machines stand up better on tracks, travel better, and the road gear saves time. I like the new tractor-type treads on hills, slick places, and on snow. They have more clearance and don't high center on rocky roads. The sealed bearings are also a very good feature."

That's the story. Equipped with sure-gripping crawlers, 15-B and 22-B dragshovels can climb grades as steep as 35%. Deep grousers provide sure traction. Ground clearance under housing is 16½" for 15-B and 20¾" for 22-B — enough to permit travel over stumps and other low obstructions. Special positive sealing protects all track-roller bearings from water, dust, grit, and dirt.

See your nearby Bucyrus-Erie distributor for details.

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Engineer Paint System For Better Results

Paint composition varies from a few to thousands of natural and synthetic chemicals. The paint job on any installation should be as carefully designed as the structural features.

By WARREN D. PALMER
Protective Coating Engineering
and Inspection Service
Houston

PAINT CAN BE composed of few or thousands of natural and synthetic chemicals, both inorganic and organic. Paint formulations must be designed, just as machines are designed.

Paint formulations are a series of compromises because all possible perfections cannot be achieved in one type of coating. Also, compromises in the use of certain materials are necessary to adjust material costs. Preparation of films which perform desired functions can involve the manipulation of a variety of important techniques using a number of materials.

Paint to the corrosion engineer is a material which can be used to coat surfaces with films to protect and decorate industrial installations. He need not be concerned with the materials formulation other than to classify it as to type, its compatibility, the thinners and fluids required for cleaning equipment. He must know the formulations recommended uses, workability requirements and its limitation so that he may put them to use in the proper environment.

Paint may be used also by the design engineer to reflect sunrays; prevent evaporation; prevent development of dangerous temperature, pressures or damage to products; prevent cold sweating of storage tanks and transfer lines; decorate and beautify the plant; or denote safety or identify materials handled within. However, since prevention of corrosion is of prime importance, the corrosion engineer should be consulted first in regard to any coating system.

Paints, industrial finishes and protecting coating materials should be thought of as formulations, as tools or materials of construction which the engineer will use to build into his design or plant the features desired. This can only be done by giving the desired features fullest consideration, properly screening and evaluating dependability and effectiveness of coating materials and their application.

It is not necessarily the paint that gives the results desired. It is the coating system. Therefore the coating engineer will be more concerned with the system, surface preparation, application equipment and conditions of each coat, prime coat, build or body coats, reinforcing material, finish coats, color, chalk, permeability, temperature and flexibility of the coating. Although this may well be called paint engineering, protective coating engineering is a more descriptive term because all materials used by the coating engineer are not paints. Coatings such as fused glass, bonded plastics, fused metals, metallizing, galvanizing and other such coating materials and methods may be used. All are quite different and highly specialized fields.

Hundreds of thousands of dollars are now being lost in industry each year because of lack of proper planning, engineering and control of the application of protective coatings to combat corrosion effectively in industrial plants and installations. Corrosion prevention begins with the plans on the drawing board, screening and evaluating coating materials under actual plant operating conditions for dependable effectiveness; the complete study and consideration of application techniques and conditions involved.

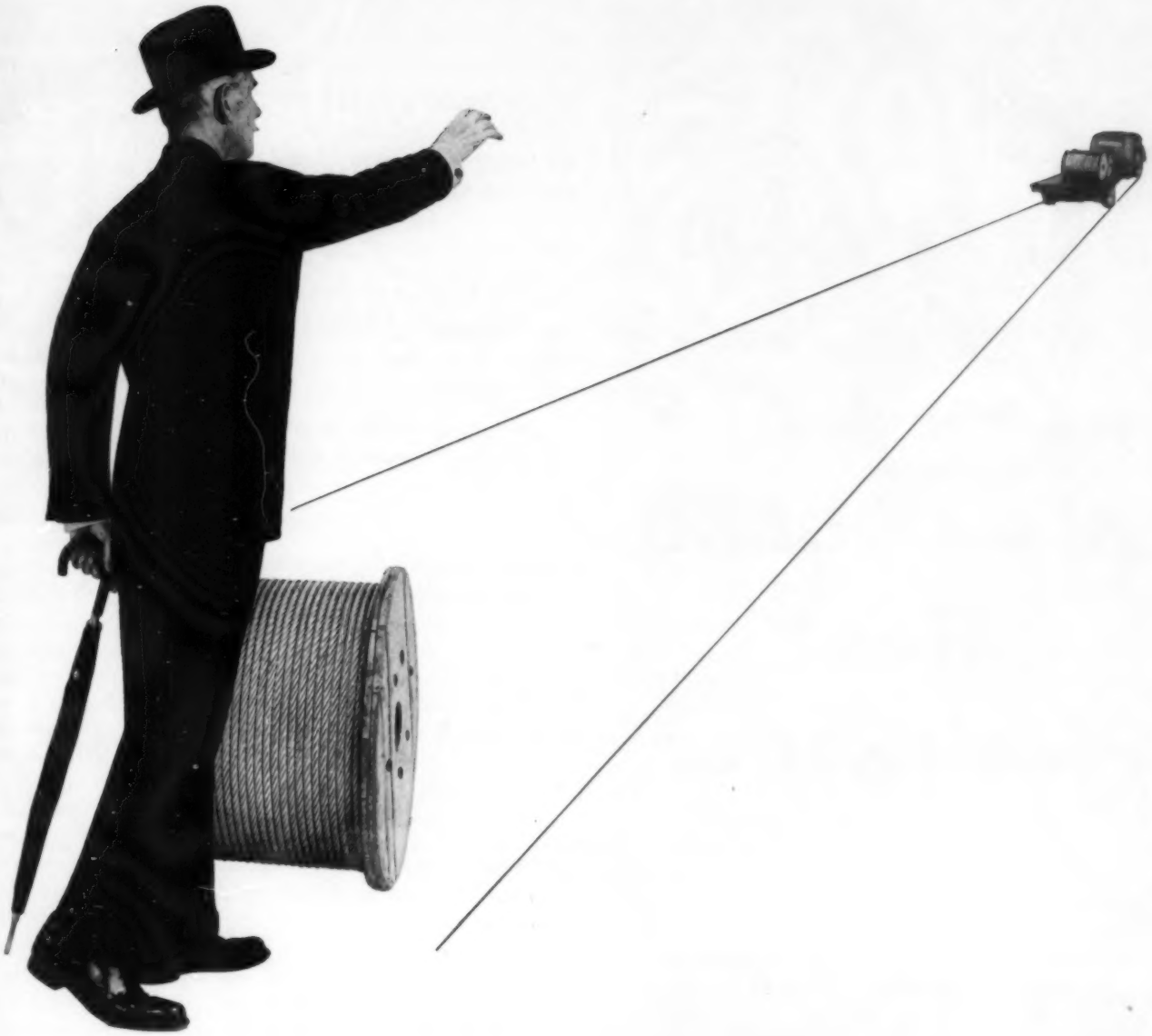
After these results and conclusions have been written into the coating or paint specifications, the job of obtaining a successful and effective coating application has only begun. It is essential to control the application and make tests, inspections, etc. to insure proper workmanship standards and coating quality. This often involves a selling job—selling the applicator thoroughly and completely upon doing the best job possible and then working with him to obtain and control such workmanship.

Corrosion losses in industry today are in a great part due to the general lack of understanding of the protective coating problem. More cost and performance data are essential. Constant control of the application is a must; also the matter of keeping records on the coating job.

Records should tell exactly what was done, the equipment used and conditions encountered. They should reflect the man hours and quantities of materials used, plus the final results obtained. Performance and condition of the coating should be closely graded at one year intervals to record the effectiveness of the coating.

Such control and tabulation of results are possible only after thorough planning and proper organization of authority by qualified personnel. Aside from the writing of general painting specifications, the authority and responsibility for painting in many large progressive plants, as well as smaller plants, are vested in various operating and general maintenance departments with little or no control, without history or performance grading or proper cost data.

Actual painting costs often are included, unaccounted for, with other



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In addition to saving on down time, your Wickwire distributor effects further economies by recommending the wire rope that will give you the longest service life, by minimizing your bookkeeping, inventory maintenance and transportation costs. He keeps your reserve stocks for you so that you don't tie up capital in stand-by materials, warehouse space and unnecessary stock insurance and handling.

Your Wickwire Rope distributor is a good man to know. He's quality people handling quality products. Buy your wire rope and slings from him. You'll find that the many valuable services he offers far outweigh any apparent price advantage you might gain by buying direct.

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Facts

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When deciding on the selection of an air-cooled heat exchanger, we suggest that you consider the following:

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How long has the manufacturer been building heat transfer apparatus?	88 years
How long has the manufacturer been building finned tube elements?	35 years
How long has the manufacturer been building air-cooled exchangers?	35 years
What is the maximum pressure for which air-cooled exchangers can be furnished?	9,000 psi
What is the maximum temperature for which air-cooled exchangers can be furnished?	1,500 F
What wind pressure will the air-cooled exchangers withstand?	40 lb per sq ft
What percentage of the total length of heat transfer elements is effective?	100%

FACTS like these, together with the results of design comparisons, explain why G-R **fin-fan** is so widely preferred for condensing and cooling services in plants all over the country. Write for complete information.

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G-R HEAT TRANSFER APPARATUS **fin-fan Exchanger**

maintenance cost figures and management does not realize the true magnitude of paint and protective coating expense. Painting is regarded as a decorative measure and not as a material of construction to be engineered to control corrosion and obtain other desired features.

Engineering Paint for Hydrocarbon Plants. To point this up, consider the many factors which should govern the paint job in a plant where propane, butane and other liquefied petroleum gases are handled or processed. They are:

1. Corrosion protection.
2. Resistance to spillage of product.
3. Endurance under maximum temperature conditions.
4. Reflectivity of sunrays and heat.
5. Chalking and self-cleaning.
6. Cold sweat prevention.
7. Non-flammable qualities of the coating.
8. Ability to insulate to reduce heat transmission to vessel and contents.
9. Seal or weather proofing coats.
10. Color code and plant beautification.

Consider each of the items individually to evaluate the performance and conditions involved.

Corrosion Protection. Corrosion will result in an unsightly plant, but, more important, it will cause premature failure of equipment, loss of production and it can endanger personnel. Every precaution must be taken to prevent such occurances. One of the most obvious ways to do this is to preserve the steel and its original safety factors.

Effectiveness of the coating will depend largely upon surface preparation of the steel, application and control of application. Sufficient film thickness of the coating must be obtained to prevent moisture from coming in contact with the steel. The protective coating engineer should specify surface preparation and proper application of primers to insure good bond of the coating with the steel surface. This is the foundation of any coating system and is just as important for good protective coating performance as the foundation is to a building structure.

Resistance to Spillage. Any protective coating applied to the inside surfaces must withstand action of the product. The coating must not dissolve, soften, blister, check, crack or otherwise be affected when submerged in the product at temperatures involved. Moisture and chemical reactions coming in direct contact with the steel are usual causes of corrosion inside equipment and vessels. A few tests in the laboratory will indicate what materials can be expected to do under these conditions.

Endurance Under Maximum Temperature Conditions. The coating may be protecting steel surfaces which are refrigerated, or are subject to low product temperatures. The coating must maintain its bond to the steel and its effective resistance to corrosive products. However, in the petroleum industries it is usually the upper range of temperatures which causes paint failure. Such temperatures are not necessarily operating conditions; the most common cause of paint failure is temperature involved when a line or vessel is steamed out or cleaned.

Reflectivity of Sunrays: This quality is a major concern to plants or transmission companies handling light hydrocarbon gases or liquids. It is especially true in regard to storage facilities. White and highly reflective paint coatings can accomplish a great deal toward stabilizing such temperature rises and pressure surges.

Chalking and Self-Cleaning: When paint installations are subject to smoke, dirt, etc., depositing, some attention should be given to provide a rapid enough chalking off of the coating to maintain a clean, highly reflective coating. This coating should be applied sufficiently thick to allow for chalking away. Replenishing coats of such materials will be required from time to time.

Such coatings have high moisture transfer rates and should not be considered when measuring coating film thickness for corrosion protection. It may be more desirable to use a high gloss enamel with a minimum chalking rate and depend upon hosing down vessels for cleanup. High gloss coats usually have low moisture transfer properties and, therefore, film thickness may be included for corrosion protection. High gloss enamels usually are preferred on tanks which are sprinkled or flooded with water to hold temperatures down.

Cold Sweat Prevention. When a product's temperature is sufficiently low to drop the temperature of the vessel's exterior surface below atmospheric due point, moisture will condense from the air and collect on the vessel's surface. Such constanly wetted surfaces may result in corrosion problems and high maintenance costs.

To prevent cold sweating, the vessel or pipe line may be insulated or coated with a cork filled insulating mastic. This should be applied over the anti-corrosive paint application. The coating is usually one-fourth to three-eighths of an inch in dry film thickness and is applied in from two to three coats. These materials are slow drying.

Non-Flammable Qualities. Most thinners and solvents used in paint manufacture are flammable, and in the storage and handling of hydrocarbon gases or liquids, flash fires often occur. Therefore, if at all possible, coatings should be non-flammable when cured (or free of solvents).

Ability to Reduce Heat to Vessel and Product. It is not intended that materials withstand fire without being damaged. It is their purpose to prevent maximum heat transfer to the vessel and its contents. In many cases, this insulation may not be a paint or coating; instead, conditions may require that the vessel be covered with one to two inches of insulation. There are also fire retardant paints, some of which are asbestos filled mastics, designed to prevent sudden and rapid heat transfer.

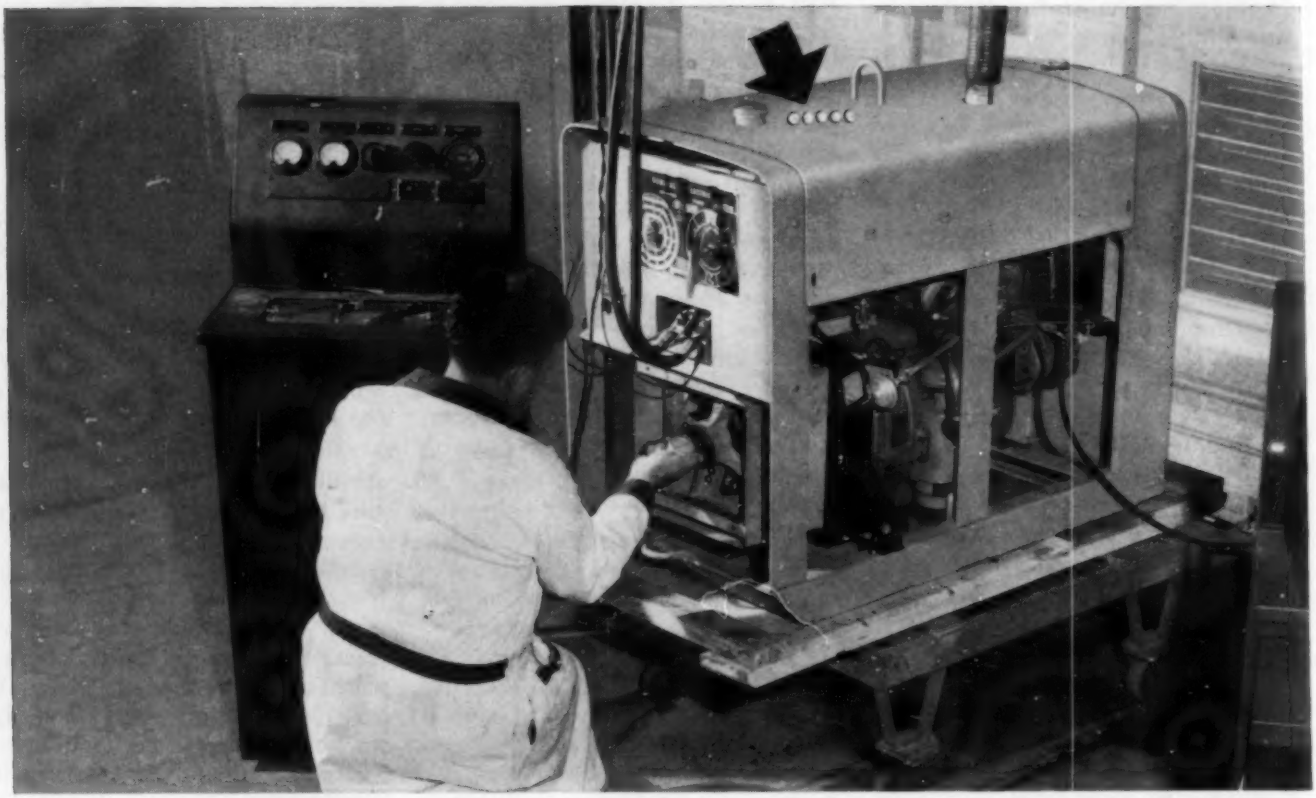
Seal or Weather Coats: Final finish weather coatings will be desirable over mastic coatings, anti-sweat, heat retardant or insulation. Either coatings or metallic banding may be used for this purpose. Either material should result in a weather and moisture-proof coating. These final finish coatings should be reflective and add to the over-all plant color scheme.

Color Coding of pipe lines and safety devices also will add a great deal toward making a beautiful installation and promote good housekeeping, safety and better morale among employes.

Costs of such painting may seem high when only first costs are considered. But if the job is well done, proper detail records of all costs including maintenance painting are kept. Within a period of five to ten years, cost records are certain to prove the economy of thorough engineering of paint and protective coating needs.

—The End

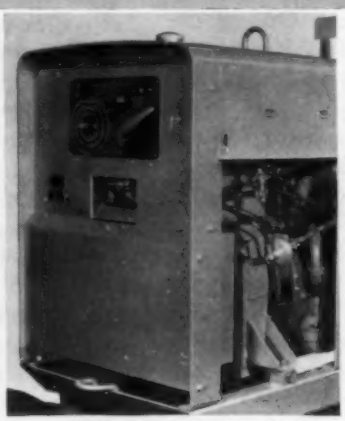
NOW! Steady Output



5 NICKELS STAND ON END while the new G-E 200-amp welder runs at full load. This unusually steady operation demonstrates the advanced engineering thought which makes the G-E engine-drive welder your best performance buy.

PROVE IT TO YOURSELF—Make this actual feature-by-feature comparison of the new 200-amp G-E engine-drive welder with two other welders of the same rating. You will see that only the new G-E welder has so many advanced design features for better welding performance at lower cost.

ELECTRODE SELECTOR, CURRENT DIAL—Dual controls simplify current control, give you easier, more accurate adjustment.



NON-PROJECTING GENERATOR—No vital parts are exposed. Full-length base encloses generator for rugged in-the-field welding.

PUSHER ENGINE FAN—Air is blown out of radiator, helping to prevent vapor lock.

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MANUFACTURER A			✓
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. . . WITH GENERAL ELECTRIC'S ALL NEW 200-AMP ENGINE-DRIVE WELDER

General Electric's new 200-amp engine drive welder maintains steady output and 100% arc stability—hour after hour—even when operated above full load.

This is made possible by combining a direct-connected Hercules engine with a generator specially designed for field use. In addition, no matter what type or size of electrode you use, or where you set the controls, this G-E welder provides complete freedom from "popouts." This is due to the high recovery voltage of the welder.

Completely field-tested on pipelines in the Houston-Tulsa areas for six months, the rugged new G-E engine-drive welder has received the enthusiastic approval of pipeline weldors, foremen, and superintendents. Check the feature-by-feature comparison chart below and see why.

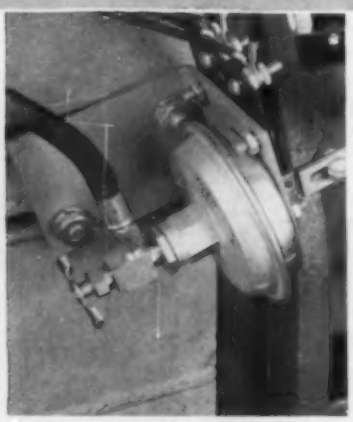
For more information, write for bulletin GEC-1333, Section 714-2, General Electric Company, Schenectady 5, N. Y., or contact your local G-E Welding Distributor. He's listed in the yellow pages of your phone book. Ask him also about G.E.'s new pipeline electrodes—W-610A and W-710A.

BUILT-IN RUGGEDNESS and easy portability of new G-E welder is proven "on location" on pipeline in Houston-Tulsa area.

GENERAL ELECTRIC

CONSTANT-PRESSURE BRUSH SPRINGS—New feature eliminates need for adjustment.

HEAVY-GAUGE METAL THROUGHOUT—16-gauge canopy, 3/16-in. channels, 1/4-in. crossbars withstand rough field conditions.



OVER 12-HOUR OPERATION—New slowdown control and 17-gallon tank give more than one-shift operation on a tank of gas.

SPRING-WOUND TRAILER AXLE—New construction of axle reduces sidesway and weaving for easier towing, better tracking.

The pipe line industry needs a final solution to displacing a pipe line load economically, quickly, and safely. This is shown by . . .

Methods of Displacing Liquid Hydrocarbons from Pipe Lines

Disadvantages of the three major methods—water, air, and gas—pose this problem for serious consideration by the industry.

By S. C. PHELPS,
Interstate Oil Pipe Line Company
Shreveport

IN THE RELATIVELY short history of the pipe line industry several thousand miles of pipe of all sizes from 2 inches to and including 16 inches have been displaced of their load of crude oil or refined products. These have been displaced for one of three basic reasons; (1) to permit extensive external repair where severe corrosion or other physical weakness dictate that for safety or other reasons repair of the line should not be attempted with the line loaded, (2) to permit internal cleaning (a) prior to switching to other service usually from crude oil to refined products or (b) prior to internal coating against internal corrosion attack, and (3) to permit salvage of the pipe for reuse or sale where a pipe line has reached its physical or economical service life.

Methods and Objectives. Basic methods of displacing hydrocarbons are limited in number, however, many variations of each are employed by various pipe line companies depending on diameter, length, terrain and numerous other factors. The mediums or substances used to displace hydrocarbons in the probable order of their magnitude are:

1. Water
2. Air
3. Natural Gas
4. Solvent or similar wash solutions
5. Water washes with detergents or alkaline degreasing compounds.

Before probing deeper into the mechanics of the methods and some of their advantages and disadvantages, the basic objectives of displacing the line load should be explained. The main ones are:

1. Recover the line load for its economic value.
2. Prevent crop damage, water polution or other damage.
3. Prevent a potential fire and/or explosion hazard.
4. Prevent damage to the pipe itself.
5. Prepare pipe for repair or salvage.

A ruptured area in 8-inch pipe damaged by explosion.

The line load or displacement, whether crude oil or a refined product, represents a commodity the recovery of which is usually an economic necessity. In short, small diameter, field lines it is sometimes advisable to gravity drain or remove the line load by taking suction with a reciprocating pump. These usually leave some oil in the line which is eventually lost. When attempting to recover the line load, its economic value must be protected by eliminating contamination to the maximum extent. Thus, one of the major concerns in the mechanics of displacement is the prevention of contamination, especially if water is used.

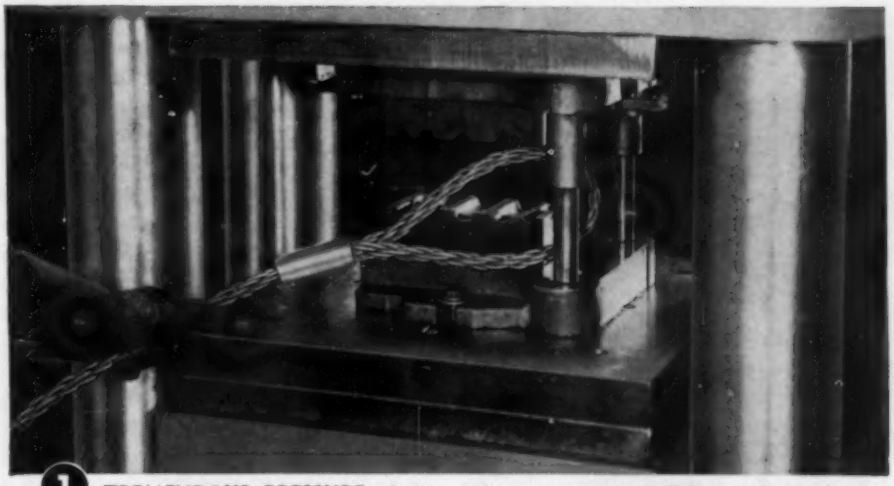
When pipe lines are to be parted for repair or modification or are to be cut for take-up following displacement, any oil or oil-water mixture escaping from the opened pipe line may result in immediate damage to crops, orchards or livestock. Since such drainage occurs in the lower points traversed by the pipe line route, stream, pond or lake pollution is always a matter of concern for possible harm to fish and water fowl. Oil into water sources in irrigated areas may cause resulting crop damages many miles away.

Concurrent with concern for damage from oil contact is the equal concern for fire or explosions that are an ever present possibility whenever oil escapes from a pipe line. Pipe line personnel are trained to take care of such loose oil and their proficiency is

Tuffy® SLING NEWS

Vol. 1 Published Monthly in Leading American Trade Magazines by Union Wire Rope Corp. No. 2

NEW Tuffy® FERRULE GIVES EYE SPLICE STRENGTH OF Tuffy® SLING FABRIC



1 **TREMENDOUS PRESSURE** of this machine in swaging Tuffy's smooth-edged metal ferrule around the tuck splice virtually flows the metal into the braided fabric interstices.

No Increase in Cost For Smoother, Safer Factory Ferrule Splice

In the most important sling development since Tuffy machine braided wire was introduced, Tuffy now offers sling users greater safety, faster sling handling, and more sling-eye strength—at no increase in price.

It's all made possible by a new steel ferrule used on all Tuffy Slings. This ferrule, slipped over the splice of the eye and pressed on under great pressure, holds so tight that it gives the eye of the sling 100 per cent of the strength of the machine braided wire fabric. The tucked-in splice is completely covered—the swaged ends of the ferrule leave no abrupt edges to catch on loads or to injure workers' hands.

Teamed up with the Tuffy machine braided sling fabric, this new ferrule makes Tuffy the sling handler's favorite for every job.

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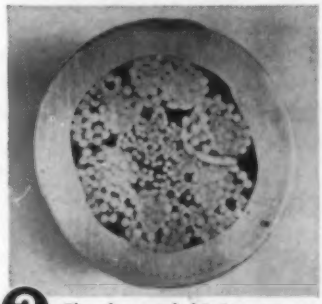
Tell him your requirements. Then let him save you the time, trouble, and money of carrying an inventory. He will stock the Tuffy Slings you want and Tuffy Hoist Lines to team up with your Tuffy Slings.



2 The force of friction set up by compressing the ferrule metal on more of the wire fabric surface forms an eye that really stays spliced.

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This big 60-page book tells you all about new factory-fitted Tuffy Slings with our pressed-on ferrule and contains complete information about a full line of factory-fitted Tuffy Slings, nearly a dozen new standard fittings, and complete data and charts on all Tuffy Slings. It also has a brand-new engineer's notebook and a valuable rigger's manual. Send for your copy now. No obligation.

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demonstrated by the industry's safety and fire loss history. Regardless of how much the dangers may be minimized, they cannot, from their nature, be totally eliminated.

Through urban areas, through forest, grain lands, prime pasture lands, extreme precautions are taken. Wherever lives of the public or company employees are at stake or where property may be damaged, no pipe line company permits preventable loss of oil from its lines. Thus, for these first three objectives it is desirable that as near 100 percent of the line load as possible be displaced into tankage or other pipe lines in the pipe line system.

The fourth objective of preventing damage to the pipe itself usually consists of two phases. First is usually the possible damage from freezing if water is used to displace the line. Timing operations to displace the line with water during the safe part of the year is the first simple solution. This may not always be possible. It is possible that a line displaced during the summer will remain in the ground through the following winter. If the line has passed its physical or economic service life and is to be salvaged, other factors may dictate that it remain in place.

Lack of a market for used pipe or in general for pipe of a particular size and grade, high take-up cost because of late harvest crops, advalorem tax rates, lack of an immediate use of the particular pipe are some of these factors. Even if a company plans to reuse the pipe at a later date as part of its material supply, it may hesitate to expend money to take-up, haul, straighten, clean, bevel and otherwise recondition the pipe for reuse. Lack of storage space near the take-up point, uncertainty of the geographic area where it will be used, possibility of misguessing as to the storage point and possible reshipment as well as tying up of capital may dictate leaving the pipe in the ground for some time.

In general, most lines displaced with water except those located in an area where freezing temperatures are not expected at pipe line depths will often require displacement of the water to prevent a major risk of freezing and bursting. Second is the possibility of inducing accelerated internal corrosion. Even the best of water available for displacing pipe lines will cause this. Contaminates present in the water will usually only increase corrosion. This will not only decrease the wall thickness and reduce its strength but will increase the inside wall roughness and decrease the flow capacity through the line if reused as line pipe.

Whatever the ultimate re-use of the pipe, as well casing, as structural members or any of the many other uses for second hand pipe, this corrosion is an economic loss. If the line is to be left full of water, the use of an inhibitor in the displacement water might be considered advisable. The length of time the pipe is estimated to remain in the ground, its economic value, and estimated possible damage from corrosion are factors.

The fifth objective of preparing the pipe for repair or salvage usually relates to safety for repair or take-up crews and possible damage to the pipe line. If the pipe is in such poor condition from internal or external corrosion, weak threads and couplings, weak welds or other conditions that it is not considered advisable to repair it in service, most safety regulations would normally prevent hot work on the line unless it is filled with water or unless it is entirely gas free. In general, this type of repair work is fast disappearing in most pipe line companies.

Main lines operating near capacity cannot be taken out of service long enough for such work. Except for short hot spot reconditioning on stub or secondary lines and occasionally gathering lines, we do not find such major repair work being employed. The indicated extreme deteriorated condition of the pipe, the economics of a better external coating and overall cheaper cost (usually considerably less labor) of using replacement pipe have decreased the frequency of such major repair programs.

No cases are known in recent years of a major repair program extensive enough to economically justify the consideration of displacing and gas freeing a pipe line. Hence, this phase usually consists of spotting a slug of water only in the section to be repaired, cut, modified, relocated or handled to minimize hazards of cutting, welding, and handling.

Where the line is to be taken up and salvaged, some precautions for take-up must be considered in determining the means of displacement. If water is used and the line is to be taken up almost immediately, interference of the water load is of some but usually minor concern, particularly if the line is freed of all but a trace of oil.

If air or gas is used the possibility and probability of a fire or explosion hazard must be determined and the procedure, if any, of detecting and removing the hazard and the procedure for cutting and take-up ascertained.

Practices in Displacing. Water displacement is perhaps the simplest and easiest method used by pipe line companies. If an ample supply of water is available or can be accumulated, full displacement with water is usually made. If water is scarce, a slug only may be used. Full displacement has the advantage of using any displacement rate desired and any pressure required to overcome static and friction heads encountered limited only by pump capacity and head. If sufficient pump capacity isn't available in a regular pump station, most companies have sufficient portable equipment that can be set for temporary use at any point desired.

A batching type plug consisting of a series of rubber cups on a mandrel but without the brushes or knives commonly associated with pipe line pigs is run between the oil and water. Multiple plugs have been run together, however, no benefits can be attributed to this according to our experience. The present day commercial plug with 3 or 4 rubber cups is an effective separator of oil and water under most conditions and effectively minimizes contamination of the oil being displaced.

Displacement rate is usually very close to the usual pumping rate through the line especially where an existing pump station can be used to pump the water, Where portable equipment must be used or for other reasons a slower rate is used however, it is desirable to keep flow rates in the turbulent range if possible. Most displacement rates are from 2-5 feet per second.

Where multiple lines or loops along a line are to be displaced, contamination must be watched closely. No procedure can be given as each case must be analyzed individually. Normally, but not aways, it is better to displace each parallel line or loop separately. If displaced simultaneously, some variation in length or

20,772 hours...2½ years of trouble-free service at Plantation Pipe Line's Akron, Alabama, Station*

...typical of

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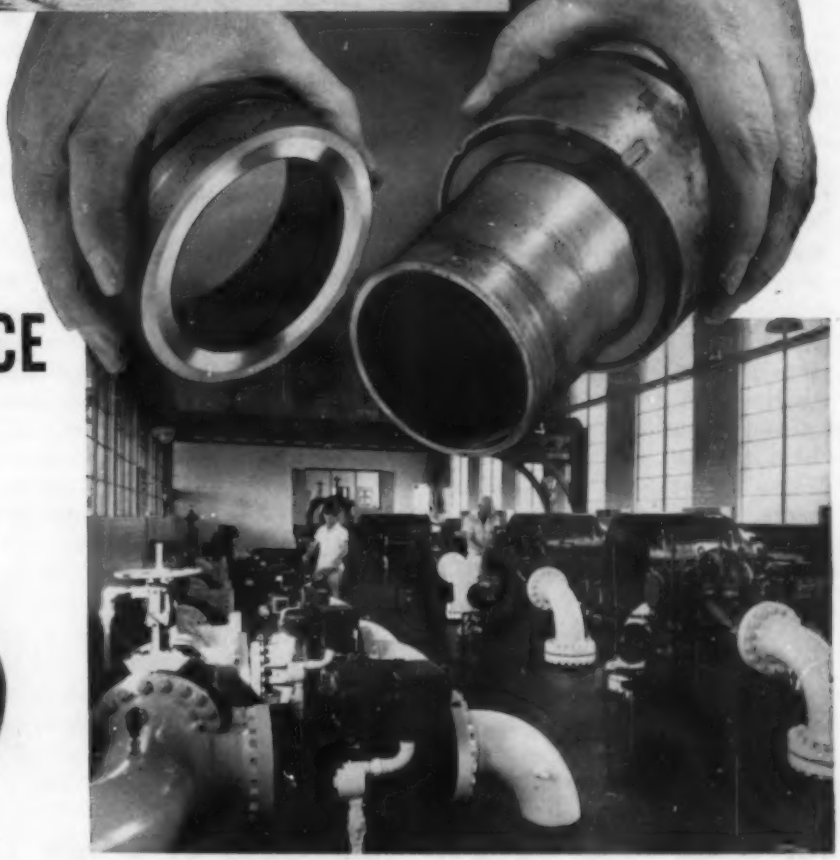
SEAL PERFORMANCE



***Case History**

"John Crane" Type 8-B Seals were installed in two high pressure 3-stage centrifugal pumps at the Akron, Alabama, Station, operated by Plantation Pipe Line Co. Pumps operated for 2½ years without shutdown. At the end of that time they were opened for inspection and parts repair. The seals, including rubber parts, were in perfect working condition. New 8-B Seals were ordered to insure repetition of this remarkable performance record. Old ones were rebuilt to serve as spares.

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flow rate will cause different arrival times at the end of the loop or parallel line.

It is often impractical to establish the required sampling proceduce at such points and often impossible to shut off or pinch the flow in one line should the water reach the point in it ahead of the other line. Leaking valves in cross-overs or other manifolding at such points may cause unexpected contamination, particularly if parallel lines or loops are displaced separately.

At points where water is to be stopped, diverted or stored, adequate sampling will be required even though a batching plug is used. This may be adequate hand sampling and testing equipment and personnel, automatic sampling of many types, recording gravitometers, dielectric constant detectors of one of several types or possible other instrumentation. A detector to indicate the batching plugs' arrival is desirable but not absolutely essential. Designated steel tankage, tank fire dikes or ponds for catching the water will be essential in almost all cases.

Since the volume and percent of contamination will not be known for sure ahead of time, some evaluation will have to be made of the interface mix. The volume of contaminated product may justify treating to separate the water and oil to permit recovery of the bulk of the oil before disposal. In any event, settling, skimming or other separation will usually be required before dumping the water to waste to prevent pollution and incurring damage. An old fire dike from which a tank had been removed and a temporary pond have been used to advantage to catch the interface mix.

The amount of oil did not justify any attempt at recovery, however, a properly installed drain in one case and a siphon in another permitted release of the bulk of the water, followed by controlled burning of the oil after which the remainder of the water was released. Piping arrangements must be planned in advance for handling the interface and temporary lines installed if needed.

While in some cases, in arid sections only, a small slug of water has been used to displace oil from a line, the water must be moved with air or natural gas with all attendant advantages and disadvantages of their use as described later, hence no advantage is seen for the use of a small slug of water. Two separation plugs would normally be used, one at the head and one at the tail of the water slug.

No less contamination, no less oil left in the line and no reduced hazards can be anticipated than if air or natural gas is used to displace oil directly. Diversion and handling of the water slug on the final receiving end has all the problems and in essentially the same magnitude as if water displacement is entirely by water.

The major disadvantage of water is that its use is restricted to the period of the year that freezing will not occur and that it cannot be left in lines during the winter in many areas where lines may be displaced.

The second disadvantage is in its disposal at the final receiving point and at intermediate points if the line is taken up without displacing the water. Normally, the trace of oil found along the line is too small to cause any damage. Its presence must be anticipated at all times and, when found, the amount determined. Large amounts must be impounded before spreading and picked up in tank trucks if economics warrant. Burning requires certain safety precaution and must be restricted in some areas and prohibited in other areas. The presence of only a trace of oil in some cases may cause a major disposal problem.

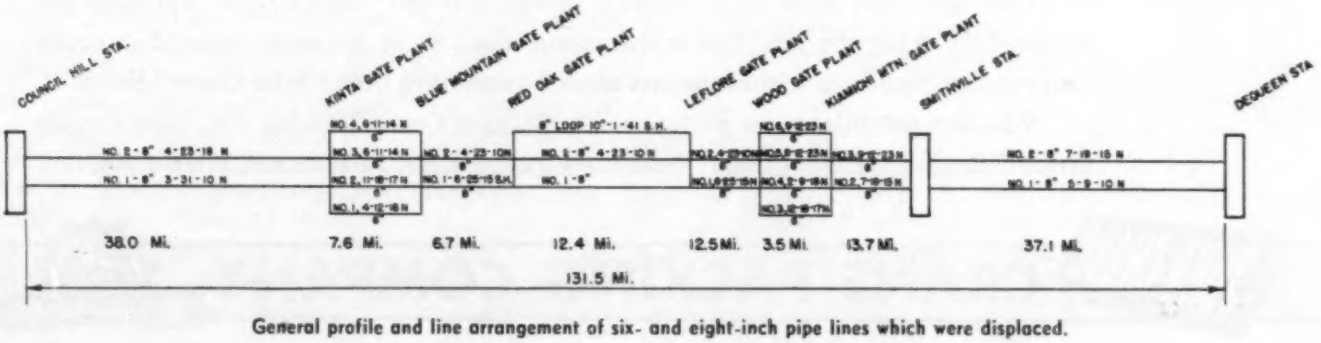
The third disadvantage is the repetition of cost if the water must be displaced by some other means. This extra cost is one factor that makes other methods very attractive in some cases.

The fourth disadvantage is the somewhat unexpected hazard in displacing the water. This is based on displacing the water with air. It is assumed that if natural gas, nitrogen, carbon dioxide or other gas is contemplated that the oil would be displaced with it directly without the intermediate use of water.

Explosion Rips Through 2.35 Miles of 8-Inch Line

At least one serious explosion occurred within a pipe line while displacing water with air. The oil in the line had been displaced with water using batching or separation plugs. A total of 44.4 miles of 6 inch and 253.2 miles of 8 inch were displaced. The 6-inch was in four parallel lines in two sections, one 3.5 miles long and one 7.6 miles long. The 8-inch was in double parallel lines for 108.0 miles and three parallel lines for 12.4 miles.

The total right-of-way distance was 131.5 miles. Scrapers had been run through all lines regularly and the oil was displaced without any scrapers hanging or other difficulties. The oil was displaced from the south



General profile and line arrangement of six- and eight-inch pipe lines which were displaced.

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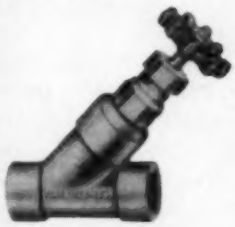

Walworth PVC Y-Globe Valves are designed to regulate the flow of alkalis, acids, inorganic salt solutions and other troublesome fluids commonly found in food, chemical and allied industries. They will give exceptional service at temperatures as high as 150°F and are designed for use with schedule 80 pipe. Other features of these valves include: (1) Three chevron, Teflon packing rings give you a leak-proof seal without binding the stem. (2) No useless threads to accumulate troublesome dirt because no stem threads enter the interior of the body. (3) Snap-on spherical plug with ball-to-cone seating arrangement to assure a tight line-contact seal between disc and seat regardless of any minor inaccuracies in alignment. (4) Full 45° angle of stem with center line of pipe to reduce pressure drop and turbulence. (5) Generously designed flow passage at the valve seat for a more even flow. (6) Back seat design allows repacking when wide open under pressure. (7) Polyethylene bonnet gasket to assure a perfect body-to-bonnet seal.

Walworth PVC Diaphragm Valves come equipped with neoprene discs. Other diaphragms especially suited to your application can be furnished. "R-2" rubber diaphragms are commonly used in systems handling dilute acids and alkalis. "J-1" Teflon diaphragms are recommended for maximum chemical resistance.

Valve design features: (1) No stuffing box or packing to replace. (2) A resilient diaphragm connected to the compressor by a stud assures a leakproof closure on the body weir or valve seat even when slurries or semi-solids are in the line. Diaphragm easily replaced without removing the valve from the line. (3) Streamlined flow area in valve body makes valve self cleaning and allows fluids to flow equally well in either direction. (4) Separation of valve body from the sealed metal bonnet protects fluids from contamination. Fluids contact only the valve body and diaphragm. (5) Completely enclosed metal bonnet protects stem from breakage and distortion.

Walworth PVC Fittings assure uniform thermal expansion of pipe and fitting threads when used on plastic pipe. They eliminate the danger of jammed threads, loose joints and the chance of galvanic corrosion. These screwed pipe fittings are: (1) Designed for use on schedule 80 of plastic pipe. (2) Walls are of uniform thickness accurately molded. Proportions are skillfully worked out in all sizes and types of fittings. (3) Fittings are chamfered to protect the thread and afford easy entrance of the pipe. Long bands provide reinforcement at the points of severest strain.

This booklet contains all the details about Walworth PVC products that you'll want to know. It describes mechanical and thermal properties, working pressures, sizes and dimensions, application and assembly data. For your free copy write to us. Please use company letterhead.

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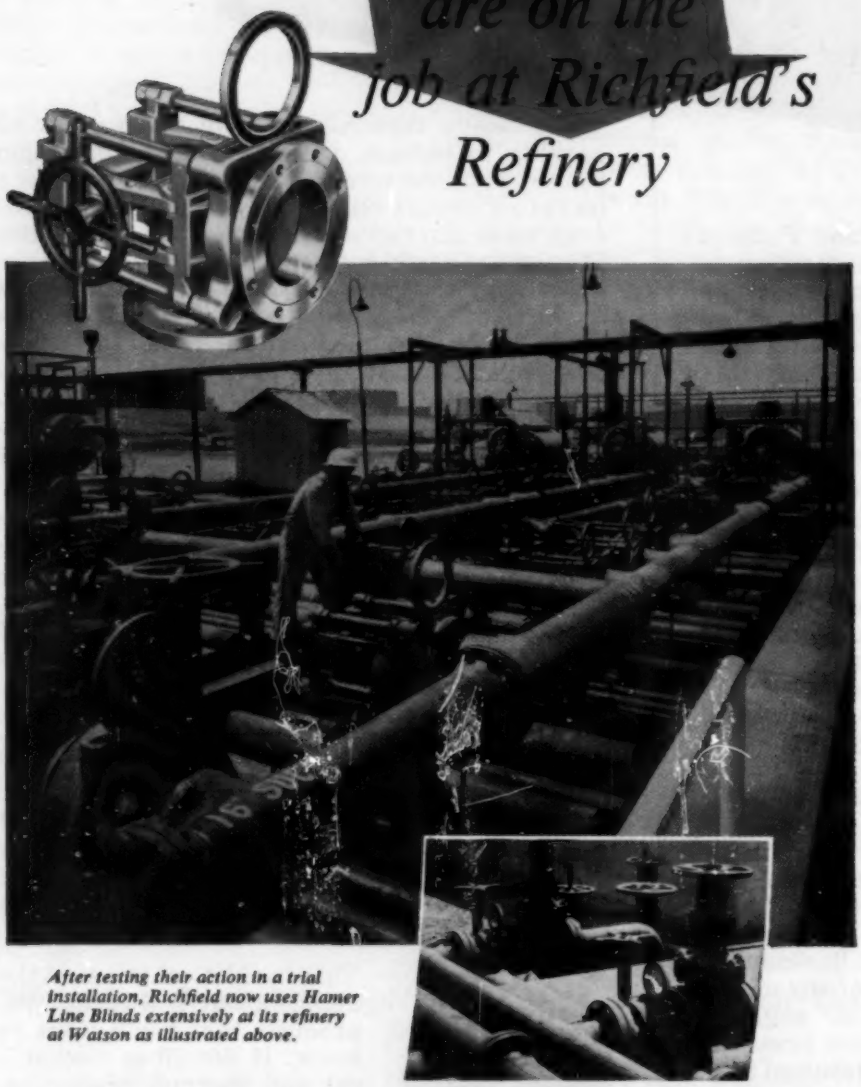

After testing their action in a trial installation, Richfield now uses Hamer Line Blinds extensively at its refinery at Watson as illustrated above.

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end to the north which was the regular flow direction. The parallel lines were displaced separately, however, pump capacity was reduced so that flow rates were very near normal for the usual operating conditions. The terrain traversed was very mountainous and rough.

After displacing the oil, two 107-cfm 500-psi compressors were set at a junction point of parallel 8-inch and 4-6-inch lines some 38 miles south of the north end of the section displaced. Water from both 8-inch lines was displaced from this point to the north. Then the 4-6-inch lines to the south were displaced. While displacing one of the 8-inch lines to the south of the 6-inch lines, a violent explosion ripped through 2.35 miles of the 8-inch. As was the practice in all cases, a 4-rubber cup separation plug was being run between the water and air. Although there were no actual eye witnesses, from all evidence it is almost certain that the explosion started at the plug and moved backwards or to the north.

It should be remembered that this displacement operation was counter to the flow of oil and the flow of water displacement. It is estimated that some 41,000 barrels of water had passed this point in displacing all of the pipe to the north. This water had had no detergent or cleaner added.

It is perhaps surprising to some that enough oil would remain pocketed or clinging to the pipe wall to form an explosive mixture after all the water and plugs that had passed this section, however, its existence is unquestionable. The source of ignition was never determined for sure and is probably of little consequence as several sources were possible and one or more would always be present. In this case the possibilities were:

1. Heat generated by the oxidation of iron sulfide or other sulfur compound left in the line by past operation. The fact that the plug was being run counter to past direction of flow and scraper runs might increase the possibility of flipping or turning a piece of iron sulfide scale and exposing an unoxidized surface. Such a piece might have been lodged in the recess in one of the screw couplings.
2. Spark, caused by a mechanical means such as rock or pieces of steel lost from scrapers run at some previous date. An old scraper blade

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was found near the plug after the explosion.

3. Spark, from a static electricity discharge, the charge having been built up on the metal core of the rubber disk plug or having been generated by agitation of water bypassing the plug.
4. Heat generated by compression from a source other than the mechanical means used to compress the air for displacing purposes, such as an unexplainable pressure surge.

The latter two are remote possibilities. The pressure at the point of the plug was less than 200 psi. No surging is probable as an employe was bleeding water at a tap approximately one mile south of the plug and no pulsating or surging was noted in the stream being bled off at any time. There was also no evidence of a surge on the recording pressure gage at the compressors which were operating at 210 psi at the time of the explosion.

Separation plug run between the air and water was not damaged.

Compressed air has been used to displace many miles of pipe line using a separation plug between the air and oil. There is a serious mechanical limitation to this method as most portable compressors readily available are limited to 150 psi or less, hence, in displacing lines with major variations in gradient or long lines where the friction head may be high, the displacement rate may be restricted at least.

This may be partially overcome by using portable pumps to relay the oil stream ahead of the plug. This requires block valves and connections for suction and discharge lines. Installation of valves, lines and pumping units as well as operation of the pumping units add to the cost. The attendant fire and explosion hazard is greater than that reviewed previously. At least one case is known where 32 miles of 10-inch pipe was blown up using this method. Exact details are not known by the writer. It is reported that in this case the air pressure was approximately 100 psi. The probable sources of ignition are the same as mentioned previously.

As mentioned previously, some companies use a small (50-200 barrel) slug of water between the air and oil, however, the washing and cleaning action probably has little to do with reducing the hazard and adds a disposal problem at the end point. Thus, this method has two principal disadvantages and little in the way of advantage.

Natural gas has been used somewhat limitedly the past few years in displacing liquid hydrocarbons. This is due largely to limited availability at the desired location. It may be anticipated that use of this method may increase particularly in the U. S. as more gas lines are laid increasing its availability. The principal objective is to exclude air from the line to eliminate the explosion hazard. This method requires that the gas supply be available reasonably close to the pipe line being displaced.

Sufficient pressure to overcome elevation and friction heads of the displaced stream is desirable, however, portable compressors may be used to boost pressure if warranted. Bypassing of the separation plug by the gas should be small with available commercial plugs and would not be objectionable or dangerous unless sufficient gas bypassed to cause vapor lock of the line or to cause damage to the receiving tank. With pressure gages and meters, the volume of gas entering the line can be accurately measured and controlled and the rate of displacement similarly controlled and estimated with reasonable accuracy.

The line should be packed and full of liquid hydrocarbon before using natural gas method. If the line has partially drained and air pockets may be present, a dangerous mixture may result. Gas may not be available for this purpose during winter months when domestic demands are high and certainly would not be in most cases during winter storm periods.

Should a separation plug hang, additional hazards exist if it becomes necessary to tap the line in an attempt to dislodge the scraper or if necessary to cut the line to remove the hung plug. Special precautions must be taken and an expensive loss of gas may occur if a long section must be bled down before cutting. Serious hazards still exist when cutting the line for take-up from the standpoint of fires and explosions.

Some consideration has been given to the use of solvent and water soluble cleaners such as various detergents and some of the alkaline degreasing compounds. To the best of the writer's knowledge, they have been used in a limited way in cleaning pipe lines that are to be internally coated with a plastic lining in place against internal corrosion. This is with the objective of removing the oil and/or paraffin film to permit adherence of the coating primarily and removal of the oil film to reduce fire or explosion hazard secondarily. Cost of material, mixing and injection are drawbacks to the use of such material in a major displacement project.

Conclusions. The only clear cut conclusion appears to be the fact that the pipe line industry does not have the final solution to the problem of displacing a pipe line at this time. The three major methods using water, air and gas have serious disadvantages under various conditions. Neither of the three leave the displaced pipe in an entirely safe condition for salvage. Water is the safest, particularly if it does not have to be displaced prior to take-up. Danger of damage from freezing is its major disadvantage. Use of air is, in general, the most dangerous of all methods. Use of natural gas is safe if properly handled during the actual displacement but may be expensive. After the liquid is displaced, the gas cannot be disposed of in such a way that leaves a very safe line. Batches of solvent and water soluble degreasing compounds have been used in a limited way and all checking of samples done to date have shown a safe gas-free atmosphere in the pipe. Use of these is slow and expensive. Many discussions have been held on the possible use of nitrogen or carbon dioxide or other non-flammable gas, however, to the writer's knowledge has never been tried. The cost and use problems detract from their probable use.

ACKNOWLEDGMENT

This paper was presented at the ASME Petroleum Mechanical Engineering Conference, New Orleans, La., Sept. 25-28, 1955.

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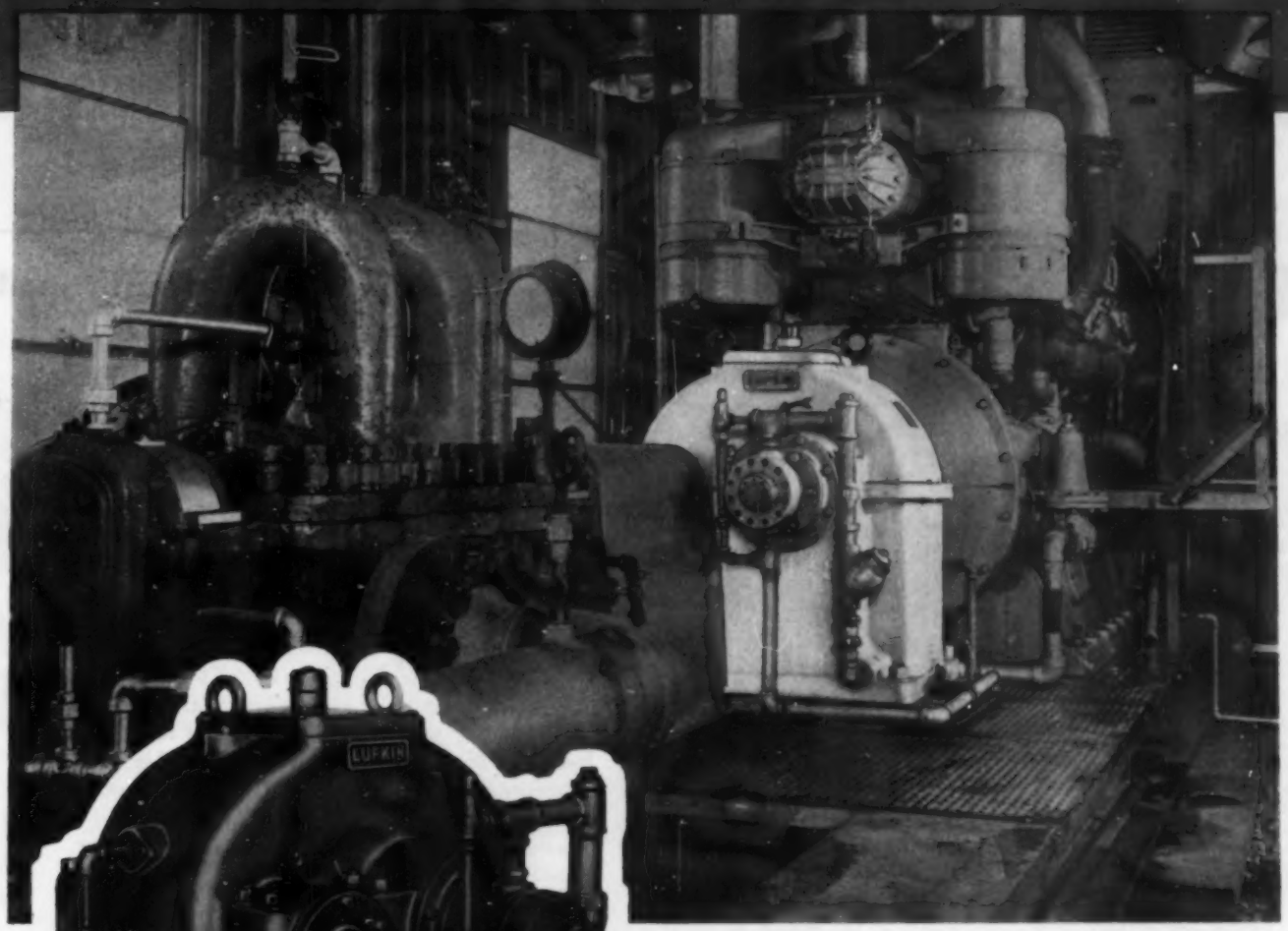

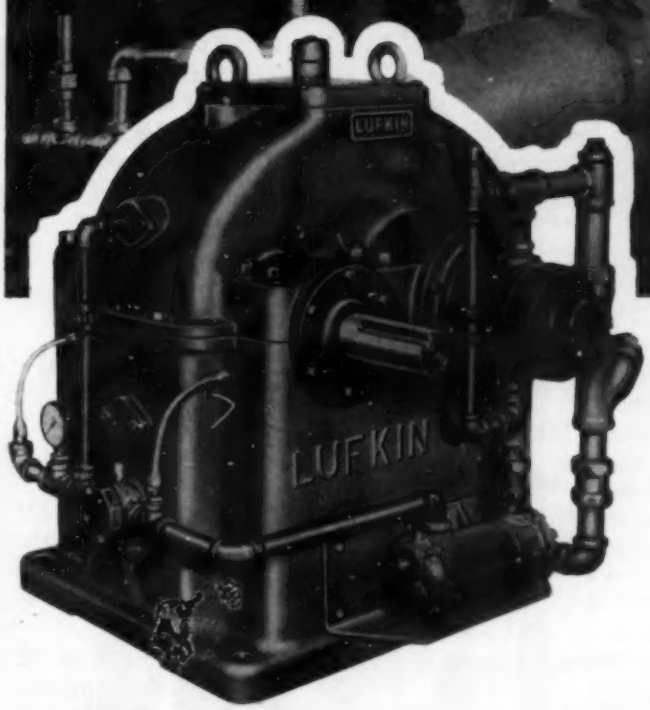

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Miscellaneous

—26—Useful Conversion Factors for the Pipe Line Rule of Thumb Notebook.

Often when a quick answer to a field engineering problem is required, an engineer's handbook may not be available. These conversion factors can be a handy addition to your Rule of Thumb Notebook. Others may be added from time to time as needed.

Pressure

Atmosphere ..... = 33.94 feet of water
Atmosphere ..... = 29.92 inches of mercury
Atmosphere ..... = 760.0 millimeters of mercury
Atmosphere ..... = 14.7 pounds per square inch
Foot of water at 60° F. = 0.4331 pound per square inch
Inch of mercury..... = 1.134 feet of water
Inch of mercury..... = 0.4912 pound per square inch
Inch of water at 60° F.. = 0.0361 pound per square inch
Pound per square inch . = 2.309 feet of water at 60° F.
Pound per square inch . = 2.0353 inches of mercury
Pound per square inch . = 51.697 millimeters of mercury

Flow Rates

Barrel per hour ..... = 0.0936 cubic feet per minute
Barrel per hour ..... = 0.700 gallon per minute
Barrel per hour ..... = 2.695 cubic inches per second
Barrel per day ..... = 0.02917 gallon per minute
Cubic foot per minute . = 10.686 barrels per hour
Cubic foot per minute . = 28.800 cubic inches per second
Cubic foot per minute . = 7.481 gallons per minute
Gallon per minute .... = 1.429 barrels per hour
Gallon per minute .... = 0.1337 cubic feet per minute
Gallon per minute .... = 34.286 barrels per day

Velocity

Foot per second ..... = 0.68182 mile per hour
Mile per hour ..... = 1.4667 feet per second

Power, Work, Energy and Temperature

British Thermal Unit .. = 0.2520 kilogram calorie
British Thermal Unit .. = 0.2928 watt hour
B.T.U. per minute..... = 0.02356 horsepower
Foot pound ..... = 0.001286 British Thermal Unit
Foot pound per second = 0.001818 horsepower
Horsepower ..... = 42.44 B.T.U.'s per minute
Horsepower ..... = 33,000 foot pounds per minute
Horsepower ..... = 550 foot pounds per second
Horsepower ..... = 1.014 horsepower (metric)
Horsepower ..... = 0.7457 kilowatt
Horsepower-hour ..... = 2,547 British Thermal Units
Kilogram Calorie ..... = 3.968 British Thermal Units
Kilowatt ..... = 1.341 horsepower
Temp. Centigrade ..... = 5/9 (Temp. ° F. — 32) Subtract 32 from the temperature in ° F. and multiply the result by 5/9
Temp. Fahrenheit ..... = 9/5 (Temp. ° C.) + 32 Multiply the temperature in C. by 9/5 and then add 32 to the result
Watt-hour ..... = 3.415 British Thermal Units

ACKNOWLEDGMENT
From the "Practical Petroleum Engineers' Handbook"; Third Edition, by Joseph Zaba and W. T. Doherty, Gulf Publishing Company (1951), pages 28-29.

J&L pipe and progress

Today's tremendous demand for the conveniences of gas gives new significance to the role of J&L pipe in gas industry progress.

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The performance of J&L pipe is typical of how J&L steel and steel products measure up to the most important test ...service on the job.

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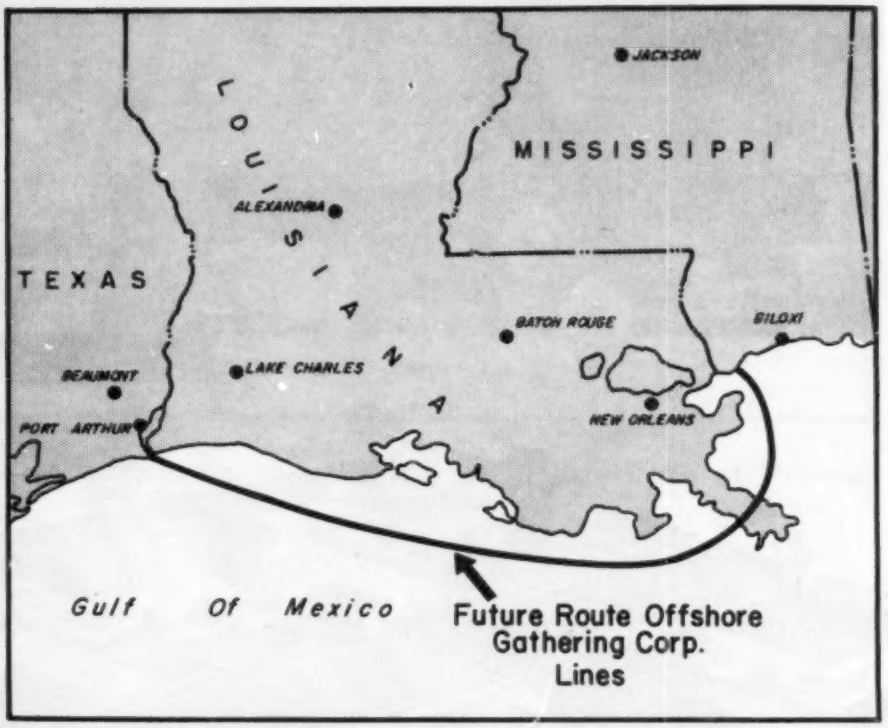
WHAT'S HAPPENING IN PIPE LINE CONSTRUCTION



Offshore Gathering Corporation To Build Dual Offshore Lines

Offshore Gathering Corporation has announced plans to construct two parallel undersea pipe lines to transport oil and gas from Louisiana offshore wells. The project, which includes a 30-inch gas line and a 20-inch oil line, will cost about $150 million.

Application has been filed with the Federal Power Commission for a certificate of necessity to build the submarine gas pipe line. Formulation of detailed engineering plans, the exact route of the pipe lines and the locations of the terminal points will not be completed until the certificate is granted.

The lines will run eastward from the Texas side of the Sabine river about 25 miles offshore Louisiana, ending on the Mississippi side of the Pearl river. Instead of circling the complete delta, the lines will cross the delta about 25 miles upstream from the mouth of the Mississippi. The water averages from 40 to 60 feet deep over this 360-mile route.

Pumping and compressor stations will be located both offshore and onshore as necessary. The construction of a liquid petroleum recovery plant to extract liquid hydrocarbons from the gas also is planned. It will be located on the Mississippi end of the line.

The pipe line system will be financed by a syndicate headed by Salomon Bros. & Hutzler of New York. The estimated costs include $96 million for the gas line, $51 million for the oil line, and $9 million for the recovery plant.

David G. Bintliff of Houston is president of Offshore Gathering Corporation. Other officers are David T. Searls, vice president and secretary; and Jack G. Taylor, treasurer and assistant secretary. In addition to the officers, directors include E. O. Bennett of Petroleum Consultants, Houston, and H. J. Moser, Associated Oil and Gas Company, Houston. Technical consultants for the project are Bennett, S. V. Collins of Collins Construction Company, Port Lavaca, Texas; and John Williams, Williams Brothers, Tulsa.

Pacific Northwest Line Receives FPC Approval

Pacific Northwest Pipeline Corporation has received FPC authorization to construct natural gas pipe line facilities to import 300 million cubic feet of natural gas daily from the Canadian border into Oregon, Washington and Idaho. The gas will supplement supplies for the Pacific Northwest line now under construction into the region from the San Juan Basin. (See PIPE LINE INDUSTRY June and October, 1955).

The company will build 304 miles of additional pipe line, substitute 420 miles of 26-inch pipe for smaller diameter lines previously authorized, and construct an additional 4340 horsepower in compression facilities at an estimated cost of $28.5 million. The new 26-inch line will bring gas from Canada into the U. S., crossing the border near Sumas, Wash.

Pacific Northwest estimates that its new facilities, including the recently authorized pipe line from the San Juan Basin in New Mexico and Colorado, will require an investment of $246 milion over a five-year period.

The FPC also issued a permit to El Paso Natural Gas Company to build a $194 million pipe line to make additional gas available to existing customers in California, Nevada, Arizona, New Mexico and Texas. The El Paso authorization includes exchanges of natural gas with Pacific Northwest.

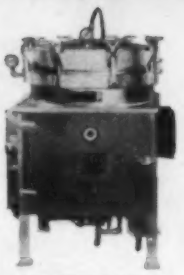
Humble Pipe Line to Sell Facilities to Shell

Humble Pipe Line Company has announced plans for selling all its trunk line and gathering facilities in New Mexico to Shell Pipe Line Corporation. Facilities involved in the transaction, which becomes effective December 31, are 49 miles of 8-inch trunk line and 85 miles of 2-inch to 8-inch gathering lines.

Errata

The name of Western Constructors, 705 Meadows Building, Dallas, was inadvertently omitted from the "Principal Contractors" list on page 64 of the October 1955 issue of PIPE LINE INDUSTRY. Western Constructors completed 77 miles of 36-inch line on this Transcontinental Gas Pipe Line Corporation construction job.

HILCO LUBRICATING and INDUSTRIAL
Oil Maintenance Equipment
Saves Your Oil, Money and Machinery



OIL RECLAIMER
For continuous oil purification in range of 2-100 gph. Removes all solids, acids and volatile contaminants.

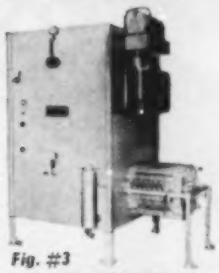
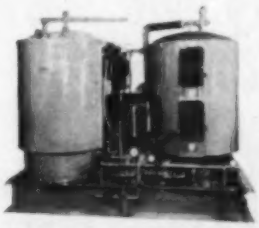


Fig. #3
PURIFIER-RE-REFINER
For all purification in batches of from 6 to 100 gallons. Removes all solids, acids and volatile contaminants.

Fig. #2
FILTER
Furnished in capacities from 0.1 to 750 gpm. Various cartridges available for mineral and inhibited detergent oils.



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Combines filtration for removal of solids and sludge with vacuum vaporization for removal of solids, acids, water, solvents, fuel dilution. Furnished in standard or custom built models to 600 gph.

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- Gas Engines
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- Buses
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- Locomotives
- Steam Turbines
- Steam Engines
- Air Compressors
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Super bending quality and workability speeds construction . . .

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There's real economy and extra speed in construction when you use Lone Star pipe. Lone Star's convenient pipe inventories, the direct haul of the pipe from the mill, the stringing of the pipe along the right-of-way without rehandling, superior bending quality . . all these facts contribute to the sweeping trend to Lone Star.

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Texas Gas Proposes to Add 200 Miles of Line to System

Texas Gas Transmission Corporation has requested authority to add approximately 200 miles of pipe line to its present system. Federal Power Commission hearings on the application for authority to proceed with 1956 construction plans have been concluded and the Commission's decision is anticipated by the year's end.

Consolidated for hearing with the Texas Gas application were applications of three Louisiana Gulf Coast producers of natural gas. Each seeks authority to make sales to Texas Gas from the East Lake Palourde field in Louisiana. These applicants are The Atlantic Refining Company, The California Company and Union Oil Company of California.

Texas Gas has requested authority to construct 110 miles of line from the southern terminus of its present 26-inch pipe line system to a purchase point at the East Lake Palourde field.

Also included in the plans is the construction of 90 more miles to include some 30-inch looping of the present 26-inch system in Arkansas and Mississippi.

109-Mile Crude Line Planned by Westspur

Westspur Pipe Line Company has received government permission to construct a 109-mile crude oil pipe line to serve southeastern Saskatchewan.

The Board of Transport Commissioners approved Westspur over two other applicants, S. & M. Pipeline Ltd. and Trans-Prairie Pipelines of Canada, Ltd.

Starting near Midale, Saskatchewan, the line will extend to the Interprovincial pipe line at Cromer, Manitoba. Construction is underway by Majestic Contractors, Limited.

McCarthy Proposes Line Near Paraguayan Border

The Paraguayan government has accepted in principle a proposal submitted by Texas oilman Glenn McCarthy to build a pipe line across the Chaco territory and a refinery on the banks of the Paraguay river.

The line is intended to bring oil from Bolivian deposits near the Paraguayan border to the market of Paraguay and Uruguay.

FREEZING WEATHER NO PROBLEM

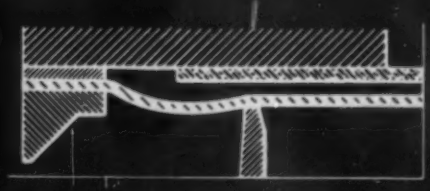
TO S&J

"TITE SEAL"

The Shand & Jurs "Tite-Seal" Breather Valve scoffs at freezing winter weather conditions. Its unique pliable diaphragm-pallet is the answer. When supplied with a special diaphragm of Teflon coated fiberglass for extreme freezing hazards, it has been found that only ¼" of water beyond normal valve setting was required to break ice. This has been determined by impartial tests conducted by laboratories, government agencies, and by independent research organizations.

For moderate climatic conditions, the S&J "Tite-Seal" is supplied with a pliable, reinforced synthetic rubber coated diaphragm. This design provides the tightest possible seal through a novel balancing action. When venting, a peeling action between the pallet and the seat overcomes sticking or freezing to a very marked degree. The "Tite-Seal," designated by S&J as Fig ST-7575, will provide maximum venting dependability for petroleum tanks, no matter what the weather conditions.

The S&J "Tite-Seal" in action. Typical pallet with pliable diaphragm shown. In operation, tank pressure is directed through a port in the diaphragm to a chamber outside the periphery of the seat but inside the periphery of the pallet, producing a slight ballooning which effects a perfectly "Tite-Seal" at all pressures below that for which the pressure pallet of the breather valve is set to open.



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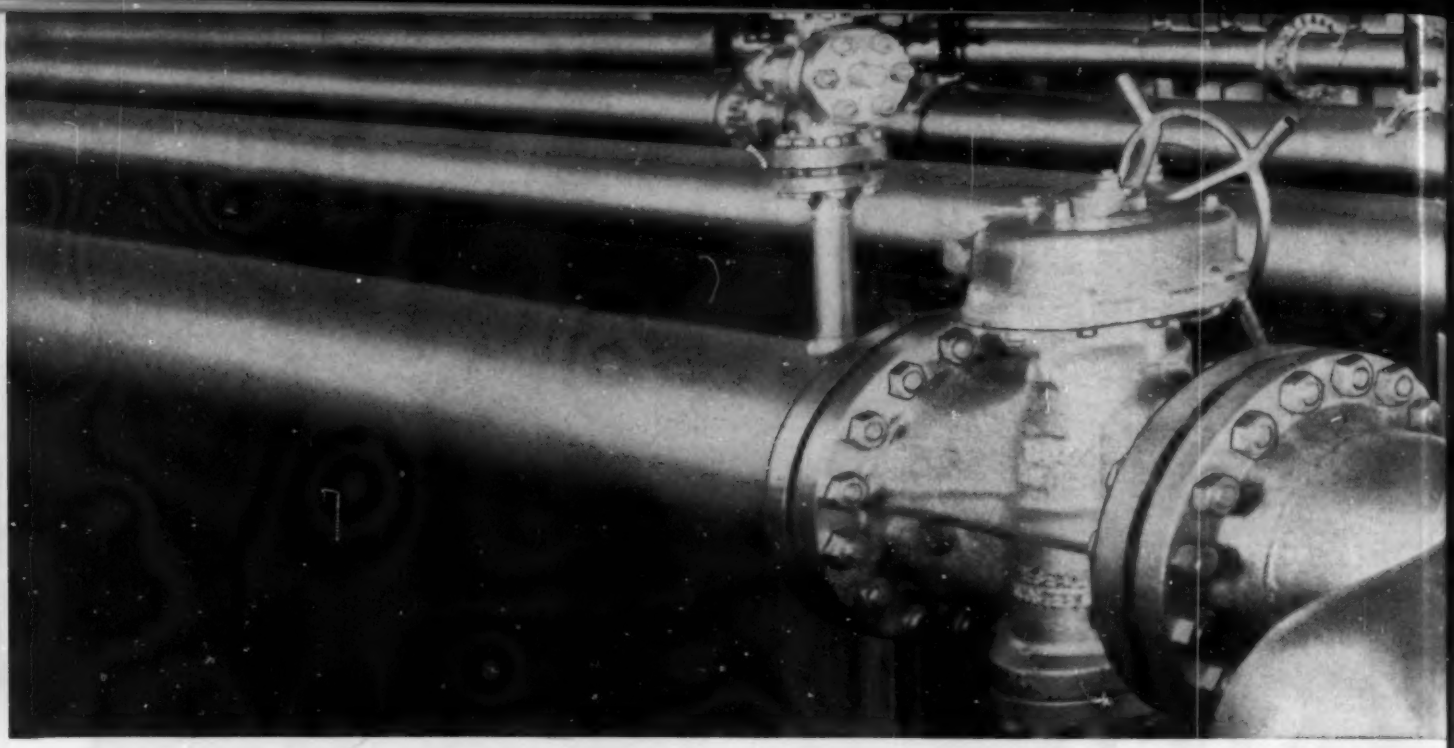
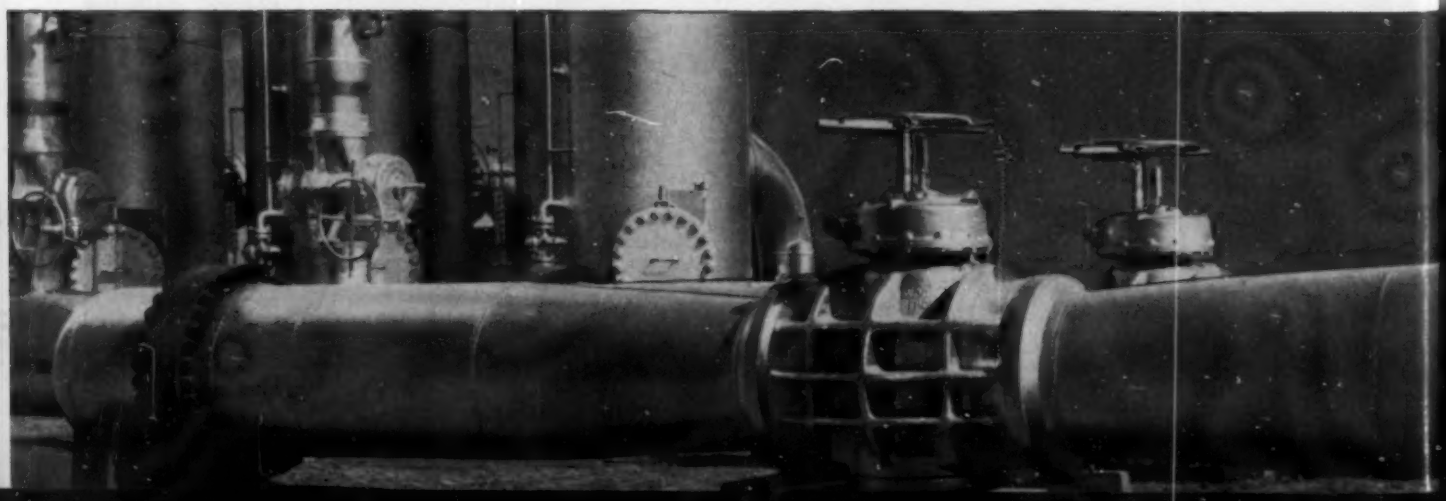
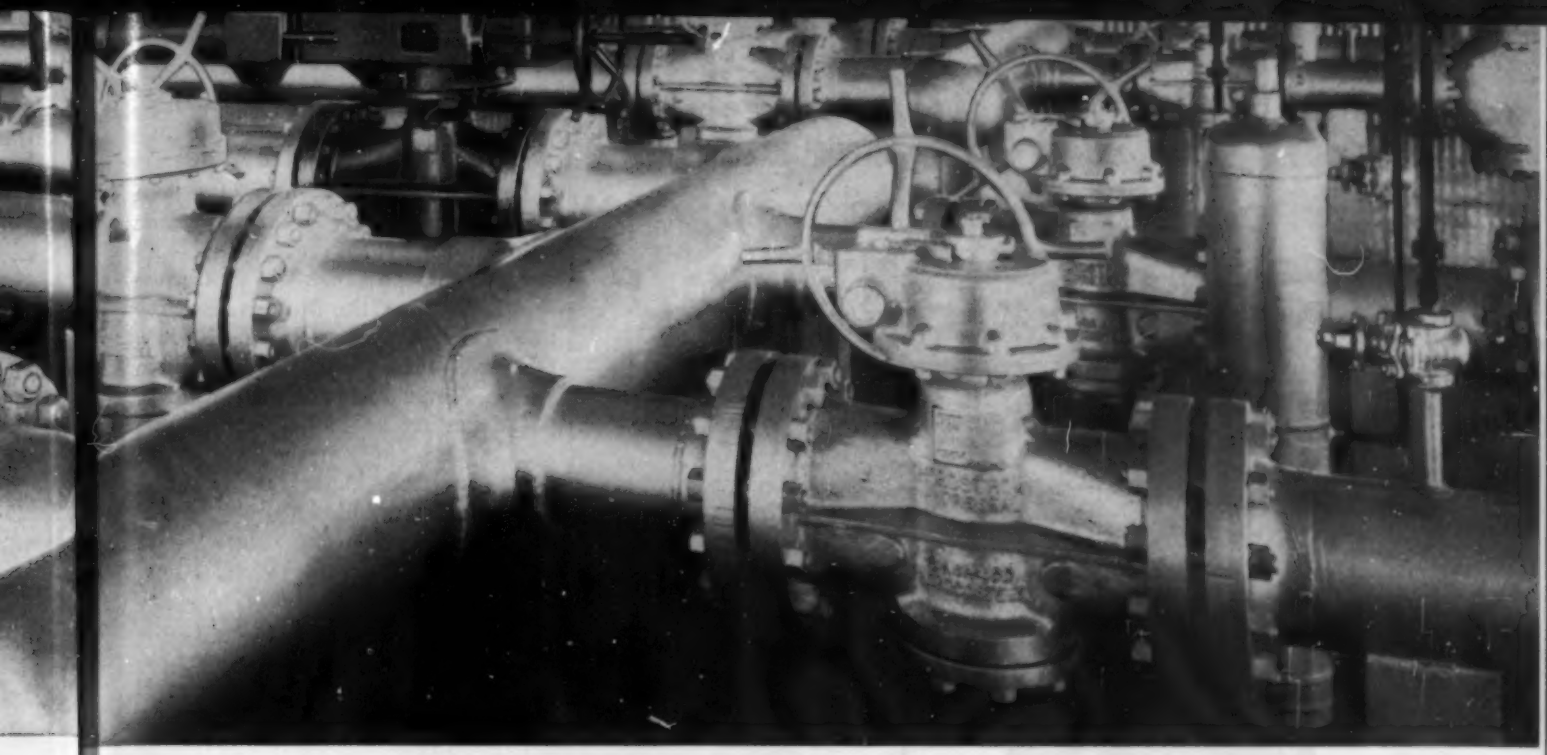


On ANY Gas Line
Rockwell-Nordstrom Valves
Assure Leakproof Control
At Lower Cost





From the gas field through the pipe line and the distribution system, Rockwell-Nordstrom valves will give you better, longer service at lower cost than any other valve you've ever used. The reason is *pressure lubrication.*

The film of lubricant between the tapered plug and the body forms a positive, leakproof seal that you can't get with the metal-to-metal closure in non-lubricated valves. The Rockwell-Nordstrom lubrication system is *continuous* . . . whether the valve is operated every hour or every month, the lubricant is *always at work* assuring leakproof sealing, and lubricating the plug for instant, one-quarter turn operation.

If you're considering automation . . . remote power operation . . . Nordstroms are your best bet because of the smooth, positive control made possible by one-quarter turn operation.

Rockwell-Nordstrom valves are the product of forty years of lubricated plug valve leadership. A *complete* range of sizes and pressure-temperature ratings makes it easy to standardize on *the original* lubricated plug valve. Write for complete information today: Rockwell Manufacturing Company, Pittsburgh 8, Pa. *Canadian Valve Licensee: Peacock Brothers Limited*

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You get *More* for your money when it's a work-saver

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Yoke or Chain Type
Bench, Kit or Post Pipe Vise

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***More* efficiency...** special design jaws that grip firmly . . . close and open fast . . . pipe rests for more accurate threading, easy cutting . . . handy pipe benders.

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Get most for your money—buy RIDGID Vises, including stand and tristand, at your Supply House!

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Williston Basin Crude Moves Through Butte Line

Crude oil from the fields of eastern Montana is flowing toward refineries through the recently completed 452-mile Butte Pipe Line. The first crude line in the area, the Butte is receiving production from the Poplar, Richey, Glendive, Gas City, Pine, Cabin Creek, Pennel and Little Beaver fields.

Originating at Poplar, Mont., the line joins existing carriers, the Service Pipe Line and Platte Pipe Line at Fort Laramie and Guernsey, Wyo. These lines move crude to refining centers at Chicago and Wood River, Ill.

Butte Pipe Line is owned jointly by Shell Oil Company, Murphy Corporation, Placid Oil Company and Northwestern Improvement Company, a subsidiary of Northern Pacific Railroad. The line was constructed and will be operated by Shell Pipe Line Corporation.

Beginning with a 10-inch diameter line in the East Poplar field in Montana, the system extends south becoming 12 inches in diameter at Glendive and increasing to 16-inch pipe as the route nears Baker. Incorporated in it is the 12-inch, 35-mile line from Cabin Creek to Glendive, formerly owned and operated by Shell Pipe Line Corporation.

Sinclair to Replace 300-Mile Line in Texas

Sinclair Pipe Line Company has announced plans for constructing a new 300-mile crude oil pipe line from Jacksboro in north-central Texas to Houston to replace an outmoded small diameter system.

The line, expected to cost approximately $14 million, will be built over a three-year period. Construction on the first portion of the line, a 150-mile segment of 8-inch pipe, is underway.

The new line will provide additional capacity to move southern Oklahoma, north Texas and East Texas crude into the Gulf Coast refinery area.

Largest Russian Line Under Construction

A natural gas pipe line with a 28-inch diameter, the largest so far in the U.S.S.R. has been reported to be under construction from Stavropol in the northern foothills of the Caucasus to Moscow, a distance of 750 miles.

119 Reasons why ARMCO Line Pipe Saves Money

This table shows the sizes (O.D. and wall thicknesses) of Armco Welded Steel Pipe for oil and gas industry applications. With this range of 119 sizes—one of the widest selections available today—it's easy to match pipe needs *exactly*. You avoid paying for more metal than you need and make important savings.

Another money-saving advantage with Armco Welded Steel Pipe is that you can order *uniform* lengths up to 50 feet. This means you have fewer joints to make and that you know in advance how many lengths and joints will be required for any installation. Costs are held down.

Use Armco Welded Steel Pipe for requirements in the Natural Gasoline and Natural Gas Divisions and wherever else you need dependable line pipe. Write for data. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 5385 Curtis Street, Middletown, Ohio. 201 KOME Building, Tulsa, Oklahoma. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO WELDED STEEL PIPE

ARMCO®

Texas Company Builds 112-Mile Line in Colombia

A 112-mile 12-inch pipe line built in Colombia by The Texas Company to link the Velasquez field with the Indian pipe line at Galan began operation recently.

Lack of transport facilities has limited output from the Velasquez field to about 4000 barrels daily, but it will now be raised to about 17,500 barrels daily and later to 25,000 bpd.

Trans-Canada Requests Time To Prove Financial Ability

Trans-Canada Pipe Lines, Ltd., has asked the Alberta Petroleum and Natural Gas Conservation Board for a six-month extension of the period granted to prove financial ability to construct the $350 million all-Canadian natural gas pipe line to eastern Canada.

The company requested the date of the hearing by the board be advanced to April, 1956.

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Houston, Texas

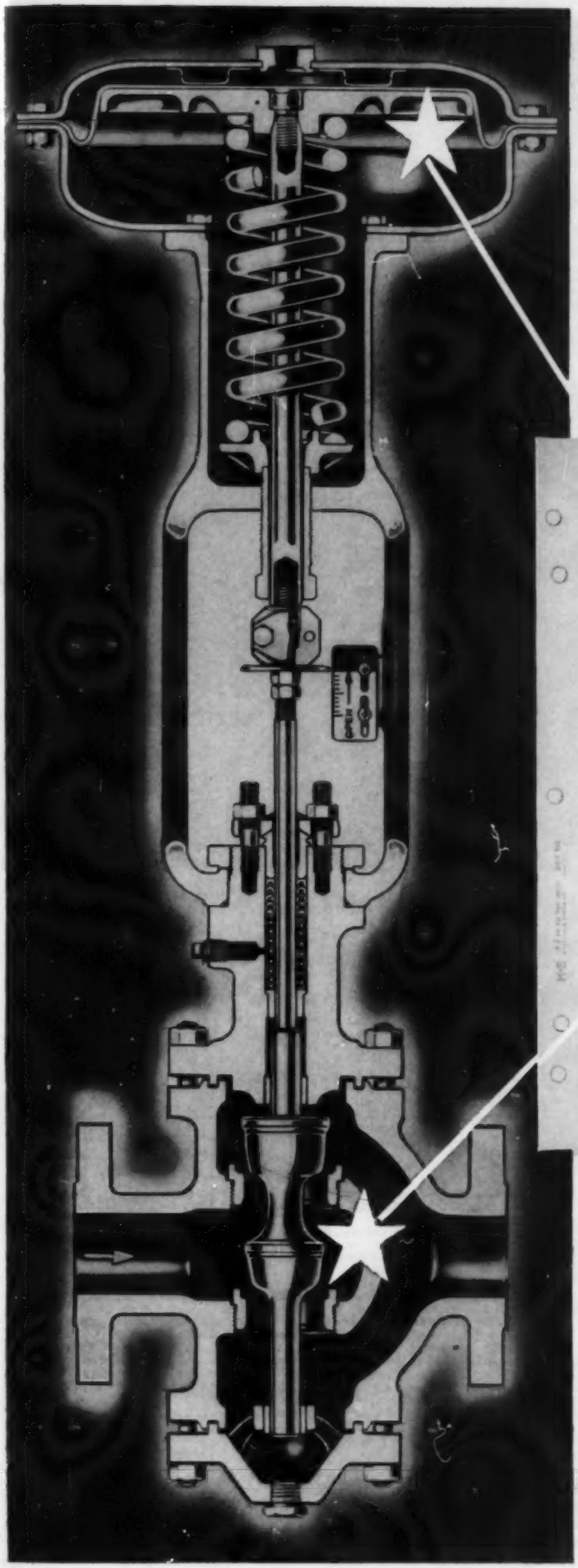
Hard work in the Louisiana marshes is made easier by the helicopters which are being used extensively by the survey crews on the "Muskrat Line."

Helicopters Speed Work On TGT "Muskrat Line"

Work of the surveying crews on Tennessee Gas Transmission Company's "Muskrat Line" has been speeded up through use of helicopters in surveying operations. The 355-mile gathering line is part of a $56 million project planned by TGT to increase system capacity to 1,800,000 Mcf daily and to 2,180,000 on peak days. The line will be laid through the Louisiana marshes to the mouth of the Mississippi on the Gulf of Mexico.

Extensive use of helicopters on this line has greatly increased surveying speed. By boat, the survey crews formerly made a half a mile a day; by helicopter, the crews are covering five miles daily.

An ideal means of transportation for the marshlands of southeast Louisiana, these whirly-birds can land on the many bayous that cross the area. In addition, the helicopters pull the 1000-foot measurement chains from stake to stake through the marshes.



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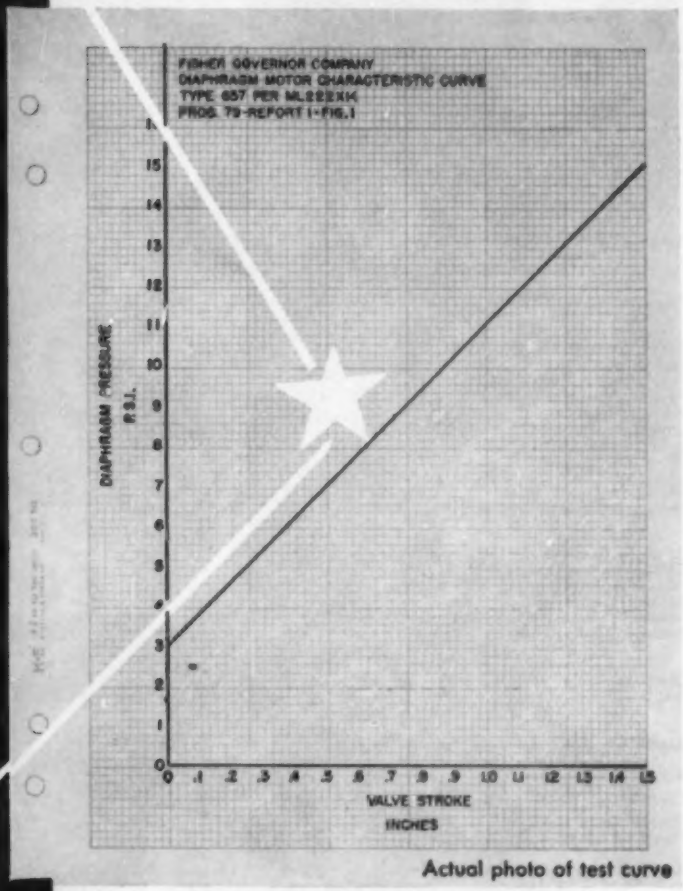

Actual photo of test curve

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Special molded diaphragm, in combination with deep casing, provides constant diaphragm effective area. Resultant linear relationship between input signal and inner valve position makes *flow versus diaphragm pressure* characteristic of control valve identical to *flow versus lift* characteristic.

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For more data on advertised products, use Readers' Service Cards, last page.

Pipe Line Contracts Not Let

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Alabama-Tennessee Natural Gas Co.—Florence, Ala.	25	8, 12	Gas	Colbert County, Ala. loop.	$808,450	Authorized
American Gilsonite Co.	80		Gilsonite Slurry	Bonanza, Utah—Western Colorado, refinery	.....	Planned
American Pipe Line Corp.—New York City (Swinerton & Walberg, Engineering)	1,425 plus 485 miles feeders & distribution lines	24, 26	Products	Beaumont, Texas area—Newark, N.J.	$170 million	Approved ODM
Arapahoe Pipe Line Co.	41	10-12	Crude	Kimball County, Nebr.—Merino, Colo.	.....	Proposed
Arkansas-Louisiana Gas Co.	66	24	Gas	Arkansas, Louisiana and Texas loops	$9,245,166	Authorized
Ar-Mex Pipe Line Co.	900	8, 12, 14	Crude	Guernsey, Wyo.—Phoenix, Ariz.	$31 million	Planned
H. W. Bass & Sons, Inc.	152	4, 6	LPG	Live Oak County, Texas—Corpus Christi, Texas	.....	Planned
Bell Oil and Gas Co.	140	6-8	Products	Ardmore—Cushing, Okla.	.....	Planned
Big Horn Pipe Line Co.—Cheyenne, Wyo.	150	8	Crude	Ash Creek, Wyo. field—Midwest, Wyo.	.....	Planned
California-Oregon Pipe Line System	103	6	Crude	Crescent City, Calif.—Medford, Ore.	$2 million	Planned
Carolina Natural Gas Corp.—701 Wilder Bldg., Charlotte, N.C.	185	2, 12	Gas	North and South Carolina	.....	Proposed
Central Hudson Gas & Electric Co.	48	12	Gas	Albany—Kingston, N.Y.	.....	Applied to FPC
Central Kentucky Natural Gas Co.	24	20, 24	Gas	Cold Springs—Anderson Ferry, Ky.	$2.5 million	Authorized
Cities Service Gas Co.—1st National Bank Bldg., Oklahoma City, Okla.	39	20, 26	Gas	To replace lines in Kansas and Missouri	$1,860,000	Authorized
	13	....	Gas	Lafayette County, Kansas	$285,000	Authorized
	15.5	16	Gas	Carter County—Garvin County, Okla.	$541,050	Authorized
Clinchfield Coal Corp.—Dante, Va.	16	12	Gas	Dickenson County, Va.—Osborne Gap, Ky.	$785,000	Authorized
Coastal Transmission Corp.—Houston, Texas	500	30	Gas	McAllen, Texas—Louisiana connection, Houston, Texas Gas	$70 million	Considered
Coast Counties Gas & Electric Co.—369 Pine St., San Francisco	40	3, 4, 8	Gas	Coast and Valley region, Calif.	.....	Planned
Colorado Interstate Gas Co.	115	4, 6, 8	Gas	Denver—Julesburg Basin—Basin Cities	.....	Before FPC
	328	16, 18	Gas	LaPlata County—Pueblo, Colorado Springs and Denver	$21,600,000	Authorized
Compania del Oleoducto Buenaventura—Cali, Colombia, S.A.	90	....	Products	Buenaventura—Cali, Colombia, S.A.	$4 million	Planned
Consolidated Gathering Systems, Ltd.	198	....	Crude	Sturgeon Field—Edmonton.	.....	Planned
Consolidated Natural Gas Corp.—New York	112	....	Gas	In Ohio—Plus other smaller lines	$6 million	Planned
Conden Petroleum Corp.—Big Spring, Texas	100	6	Products	Big Spring—Abilene, Texas	$1.5 million	Proposed
Deep Rock Gas Co.	120	6	LPG	Tioga, N.D.—Canadian border	.....	Planned
El Paso Natural Gas Co.—El Paso, Tex.	500	34	Gas	Parallel from San Juan Basin to Topock, Ariz.	.....	Proposed FPC
	31.9	8	Gas	Final County, Ariz. Service Line.	.....	Before FPC
	119	3-6	LPG	Bloomington—Gallup, N.M.	.....	Planned
	62	14	Gas	Coke County—Midland County, Texas	$2.2 million	Authorized
Empresa Nacional del Petroleo	80	6	Products	Concon—Santiago, Chile	.....	Planned
Freedom-Valvoline Oil Co.	34	8	Products	Harpster—Findlay, Ohio	$700,500	Planned
Governments of Southern Rhodesia and Portuguese South Africa	200	....	Products	Beira, Portuguese Mozambique—Umtalia, Southern Rhodesia	.....	Considered
Hope Natural Gas Co.—445 W. Main St., Clarksburg, W. Va.	33	8, 10, 12	Gas	Wyoming County, W. Va.—Buchanan County, Va.	.....	Proposed
Houston Texas Gas & Oil Co.—4604 Main St., Houston	961	12-30	Gas	Baton Rouge, La.—Miami, Fla.	$110 million	Before FPC
Idaho Natural Gas Co.—Goodland, Kansas	....	....	Gas	Pacific Northwest line—points in Southern Idaho	.....	Proposed
International Pipe Line Co., Inc.—227 N. Colfax Ave., Minneapolis, Minn.	132	8	Products	Wrenshall, Minn.—Minneapolis Bulk Terminal	$4,250,000	Planned
Interprovincial Pipe Line Co.	120	24, 26	Crude	Cromer, Manitoba—Clearbrook, Minn.	$9 million	Proposed
Iraq Petroleum Co.	75	24	Crude	Homs, Syria to Tripoli, Lebanon	.....	Proposed
Lateral Gas Pipe Line Co.—Cedar Rapids, Iowa	27	4	Gas	Grant—Clarinda, Iowa	$267,000	Proposed
Lone Star Gas Co.—Dallas	230	22, 26	Gas	Cotton County, Okla.—Fritch, Texas	$18.7 million	Before FPC
	205	....	Gas	Snyder, Texas to tie in with Cotton County, Okla.—Fritch, Texas line	.....	Before FPC
Malco Pipe Line, Inc.	91	6	Products	Prewitt, N.M.—Albuquerque	$1,250,000	Planned
Manufacturers, Gas, Light, and Heat Co.	72	16-20	Gas	Doddridge, Wetzel, and Marshall Counties, W. Va.	.....	Planned
	213	3-26	Gas	Various locations in Pa., W. Va., and Ohio	.....	Planned
	40	....	Gas	Allegheny, Washington, and Beaver Counties, Pa.	.....	Planned
Michigan-Wisconsin Pipe Line Co.—500 Griswold, Detroit	252	4-24	Gas	Various locations in Illinois and Wisconsin	$11 million	Proposed
Midwestern Gas Transmission Co., Houston, Texas	1112	....	Gas	Emerson, Manitoba—Nashville, Tenn.	$98 million	Before FPC
Mississippi River Fuel Corp.	190	10-18	Gas	Laterals in Woodlawn and Waskom Gas Fields, Texas	.....	Planned
Missouri Central Gas Co.	25	6	Gas	Moberly—Macon, Mo.	.....	Proposed
Missouri Public Service Co.—Warrensburg, Mo.	136.4	8-10	Gas	New Franklin, Mo.—Grundy County, plus laterals	$5 million	Proposed
Montana-Dakota Utilities Co.—Minneapolis	56	2, 4, 6	Gas	Hettinger and Stark counties, N.D.	$728,854	Authorized
	44	....	Gas	Various locations in S.D. and Wyoming	$1,414,200	Authorized
	41.8	12	Gas	Williams County, N.D.	$1.4 million	Authorized
Moore-Stoner Co.	200	6	Products	Glendive, Mont.—Minot, N.D.	$2.5 million	Planned
NATO	1920	4-10	Products	To serve military bases in Western Europe	.....	Foster-Wheeler Prime Contractors, 425 miles let
Natural Gas Pipe Line Co. of America—20 N. Wacker Dr., Chicago	350	20, 26	Gas	Wise County, Texas—Fritch, Texas	$28.5 million	Before FPC
Natural Gas Producers, Inc.—Colorado Springs	61.8	12	Gas	Yenter Pool—Denver	$1,374,000	Planned
	49	10	Gas	Denver-Julesburg Basin—Fort Morgan, Brush and Denver	.....	Planned
Nevada Natural Gas Co.	114	12, 16	Gas	Various loops along Needles, Calif.-Las Vegas, Nev. line	$2.5 million	Planned
New River Gas Co.	50	....	Gas	Summers-Monroe Counties, W. Va. and Narrows and Dublin, W. Va.	.....	Planned
New York State Natural Gas Corp.	56.5	30	Gas	Tioga County, Pa.	$7 million	Before FPC, 12 miles Authorized
NNCW Pipe Line Co.—Dallas, Texas	127	8, 10	Crude	Clareton Field—Casper, Wyo.	$3.6 million	Planned
Northern Natural Gas Co.—2223 Dodge St., Omaha	167	24	Gas	Farmington, Minn. to Luluth, Minn. and Superior, Wis.	$12 million	Before FPC
	....	....	Gas	To interconnect with Natural Gas Pipe Line	$244,000	Planned
	28.4	30	Gas	Test lines to underground storage near Redfield, Iowa	$4.8 million	Before FPC
	15	24	Gas	To main line in Nebraska	.....	Before FPC
	163	10, 12	Gas	Various locations in South Dakota, plus 307 miles of branch lines	.....	Before FPC
	6	6	Gas	Iowa loop and compressor additions in Texas	$760,000	Before FPC
Northwestern Utilities, Ltd.—10124-104th St., Edmonton, Alberta, Canada	42	12	Gas	Bonnie Glen—Edmonton, Alberta	$1.4 million	Proposed
Offshore Gathering Corp., Houston	364	24, 26, 30	Gas, Crude	Texas side of Sabine River 25 miles offshore La. to Mississippi side of Pearl River	$150 million	Proposed
Pacific Gas & Electric Co.	190	34	Gas	Various loops, between Topock, Ariz.—Milpitas, Calif.	$4 million	Proposed
Pacific Northwest Pipe Line Corp.—M & M Bldg., Houston	1770 plus 443	22, 26	Gas	San Juan Basin—Pacific Northwestern states and Canadian border terminus near Sumas, Wash.	$246 million	Contracts let for 1221 miles
Pawnee Pipe Line Co.	15	8	Crude	Northeast Colorado Sector—Denver-Julesburg, Basin	.....	Planned
Permian Basin Pipe Line Co.	11	6	Gas	Lea County, N.M.	.....	Before FPC
Petroargentina	370	16	Crude	Newguen—Bahia Blanca, Argentina	$40 million	Planned
Petroleos Mexicanos—Ave. Juarez, 94, Mexico City	440	20	Gas	Brazil—Tampico—Poza Rica, Mexico	.....	Planned
	260	6, 8	Products	Lagos, Mexico—Guadalajara, Aguascalientes and Salamanca	.....	Planned
	145	12	Crude	18 de Marzo Field—Monterrey, Mexico	.....	Considered
	....	....	Gas	Macuspana region of Tabasco to Veracruz port of Minatitlan	$6 million	Planned
Phillips Petroleum Co.—Bartlesville	54	6	Products	Goldsmith—Borger, Texas	.....	Planned
	50	....	Ethylene	Sweeny—Pasadena, Texas	.....	Planned
Pioneer Natural Gas Co.	261	3-22	Gas	Various locations in Texas Panhandle	.....	Planned
S. & M. Pipe Line Co., Ltd.	100	8-10	Crude	Midale, Frobisher, Steelman, Lampman, Alida, and Nottingham, Sask. to Cromer, Manitoba	$4.5 million	Proposed
Salt Lake Pipe Line Co.	....	....	Products	El Paso, Texas—Albuquerque, N.M.	$4 million	Planned

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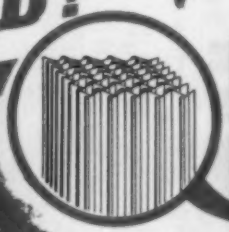
GUARANTEED!

PLUS

GREATER EFFICIENCY
MAXIMUM SEPARATION
MINIMUM PRESSURE DROP

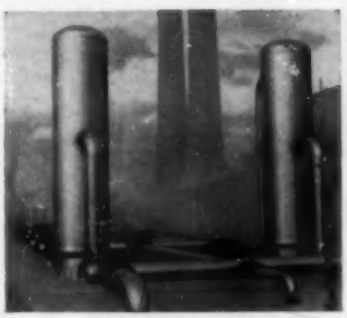


PEERLESS MIST EXTRACTOR UNIT

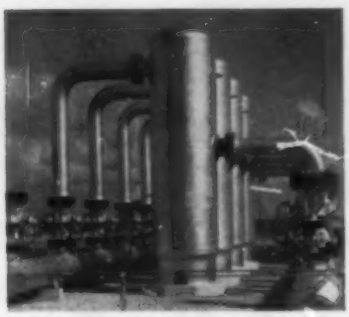
The Peerless Vertical Gas Scrubber, proved by many years of continued use throughout the oil and gas industry, is the result of careful engineering, design, manufacturing and much field experience.

These units have equally high efficiency at low or high gas flows. This efficiency is maintained whether a fine entrainment or slugging problem exists.

Through the use of the famous Peerless Mist Extractor Unit, now serving so efficiently in scrubbers, fractionators, absorption towers, refineries, and gasoline plants throughout the world, Peerless can build their scrubbers smaller than most scrubbers of other makes and... PEERLESS CAN GUARANTEE THE PERFORMANCE OF THESE SCRUBBERS! THEY ARE GUARANTEED TO REDUCE ENTRAINMENT LOSS TO LESS THAN 1/10 GALLON PER MILLION STANDARD CUBIC FEET OF GAS!



Two Peerless 48 x 19 Scrubbers, each handling 50 million CFPD at 250 PSI on inlet of a power plant in South Texas.



FOUR Peerless 60" x 19" Scrubbers handling a total of 132,000,000 CFPD at 600 PSIG. working pressure. Located at new pipeline compressor station.

Shown above is a cutaway of a Peerless Vertical Scrubber. This illustration indicates the path followed by the gas stream as it passes through the scrubber.

Peerless Precision Engineered Scrubbers available in vertical or horizontal sizes or can be built to your requirements... FOR ANY GAS FLOW... FOR ANY WORKING PRESSURE.

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Pipe Line Contracts Not Let—(Continued)

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Santos Jundiai Railway Co.—Brazil	....	8, 14, 22	Crude & Products	Expansion of Santos—Sao Paulo system	$5 million	Planned
South Alberta Pipe Line, Ltd.	46	10	Gas	Etzikom Field—Medicine Hat, Alberta	$1 million	Proposed
Southern Calif. Gas Co. and Southern Counties Gas Co.	278	30	Gas	Topock, Ariz.—Los Angeles	$31 million	Planned
Southern Natural Gas Company	39	....	Gas	Various locations in Ga. and La.	$2.2 million	Authorized
Standard Pipe Line Co.	350	16	Crude	Glendive, Mont.—Guernsey, Wyo.	.....	Before ODM
	330	16	Crude	Wink, Texas—Albuquerque, N.M.	.....	Before ODM
Standard-Vacuum Oil Co.	90	....	Crude	Lirik Field, Palembang, Sumatra	.....	Planned
Stanmount Pipe Line Co.	140	10	Crude	Cayuga and Beaver Lake Fields, N.D. to connect with Interprovincial Pipe Line	.....	Planned
Sturgeon Pipe Line Ltd.	100	12	.....	Sturgeon Lake Field—Trans-Mountain system	$6,500,000	Planned
Sunflower Pipe Line Co.—Tulsa, Okla.	265	3-6	LPG	Kearny, Grant and Haskel Counties, Kansas—Wichita, Kansas	$3.5 million	Authorized
Tennessee Gas Transmission Co.—Box 2511, Houston	220	26, 30	Gas	Loops in Kentucky and Ohio plus 376 miles of Supply	$56 million	Authorized
(See also Midwestern Gas Transmission Co.)	100	....	Gas	Gathering lines in Texas and Louisiana plus station additions	$18.6 million	Before FPC
	162	....	Gas	Loop Lines in Kentucky, Ohio, and Pennsylvania	$24.3 million	Before FPC
Texas Eastern Transmission Corp.	400	....	Gas	Near Reynosa, Mexico—Beaumont, Texas	.....	Planned
	1,050	....	Gas	Border near Emerson, Manitoba—Nashville, Tenn.	.....	Proposed
Texas Eastern Transmission Corp. and Texas Eastern, Penn-Jersey Corp.	11	....	Gas	Loops in Philadelphia area plus compressor facilities	$2.4 million	Authorized
Texas Gas Transmission Corp	198	20	Gas	East Lake Palourde, La.—main trans. line	$20 million	Before FPC
Texas-Ohio Gas Co.	....	10	Gas	Connection with Transco line to Carolina and Georgia points	....	Considered
	....	....	Gas	Houston, Texas—Miami, Fla.	.....	Considered
Trans-Canada Pipe Line, Ltd.—Calgary, Alberta	2240	30, 36	Gas	Alberta—Eastern Canada	$297 million	Planned
Transcontinental Gas Pipe Line Corp.—3100 Travis St., Houston	....	....	Gas	Connecting facilities with Texas Eastern Penn-Jersey in Pennsylvania and New Jersey	$131,628	Authorized
	24.2	....	Gas	Gathering Lines from South Bayou Mallet, Maxie and Happytown Fields, La.	$754,000	Authorized
Triangle Pipe Line Co.	560	12	Products	Arkansas City, Ark.—Covington, Ky.	$24.5 million	Proposed
Union Gas Co. of Canada, Ltd.—Chatham, Ontario	180	24	Gas	Dawn Gas Field to Lamberton County to deliver gas to Dominion Gas Co.	.....	Planned
Union Oil Co. of Calif.	815	....	Shale oil Products	Rifle, Colo.—Los Angeles	$56 million	Planned
United Gas Pipe Line Co.	63	16, 20	Gas	Various locations in Miss., Ala. and Florida	$8.3 million	Authorized
United Natural Gas Co.	50	12	Gas	Elk County—Jefferson County, Pa.	.....	Planned
U. S. Dept. of Defense	97	....	Crude	Elk Hills Naval Reserve—Los Angeles	$8 million	Considered
U. S. Navy	450	8	Gas	Gubik Field—Fairbanks, Alaska	$20 million	Planned
Utah Natural Gas Co.	40	16	Gas	Orem—Salt Lake City, Utah	.....	Planned
Virginia Natural Gas Co.	153	....	Gas	Buckingham—Richmond and Portsmouth, Va.	.....	Planned
Warren Petroleum Co.	54	4-30	Gas	Lea County, N.M.	.....	Planned
Washington Gas Light Co.—Washington, D.C.	11	24	Gas	Chillum Station—Gordon's Corner, Md.	$2 million	Authorized
West Coast Pipe Line Co.—Mercantile Bank Bldg., Dallas	960	24, 26	Crude	Wink, Texas—Norwalk, Calif.	$106 million	Planned
Westcoast Transmission Company, Ltd.	650	30	Gas	Peace River Fields—Sumas, Wash. Connecting with Pacific Northwest Pipeline—Second Line	$140 million	Planned
Wilcox Trend Gathering System, Inc.	16	16	Gas	Gathering lines to Provident City, Texas	$2.9 million	Before FPC
Winnipeg and Central Gas Co.	450	4-8	LPG	Tioga, N.D.—Winnipeg, Canada	$20 million	Planned
Wyoming Gas Products Corp.	....	....	Gas	Gathering system in Weston County, Wyo. to feed gasoline plant	.....	Planned
Yacimientos Petroliferos Fiscales Bolivianos	....	10	Crude	Oruro, Bolivia to Arica, Chili	$10 million	Planned

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BOX 3096 • TULSA, OKLAHOMA

J. P. Neill and Company and C. S. LeNoir and Company — operating as a joint venture — have completed 77 miles of 36-inch pipe line loops in Georgia and South Carolina for the Transcontinental Gas Pipe Line Corporation of Houston, Texas. Pipe line construction work was completed two months ahead of schedule.

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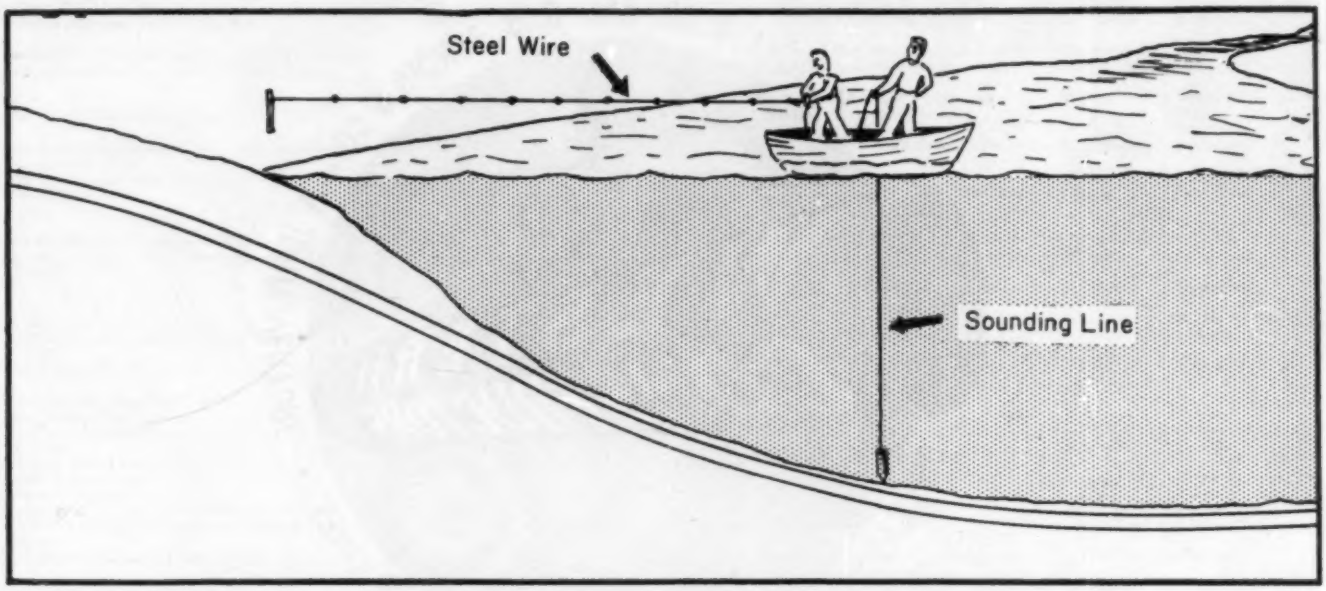
How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas



Steel Wire Line Used in Surveying River Crossing

When a line is laid in a river, engineers are faced with a task of carefully recording its depth and its location. One way to do this is to use a small diameter steel wire line which has small lead markers every ten feet to determine the distance from shore.

The depth of the ditch and the pipe line are determined by sounding at each increment of width. For best results, the wire line should be the high tensile strength wire line which is used for measuring depths in oil wells.

Orifice Meter Measures Flow Of Gas in Opposite Direction

On a trunk line of a gathering system where there is a back flow of gas through the meter run due to reverse build-ups of the line pressure, install pipe taps on both sides of the orifice plate and make the same orifice do both jobs.

From the pipe taps, differential pressure tubes are led off into the house sheltering the chart clocks, where one set of tubes is connected to a chart clock. The tubes for measuring the differential pressure of the gas when moving in the opposite direction are connected to another identical chart clock.

When the meter is in operation, both clock springs are wound, charts are fastened to the rotating mechanism and started turning at the same time.

The static pressure pen shows the same reading on both charts. However, the differential pen on one chart will swing out from the zero position onto the chart, but the differential pen on the other chart will remain positioned at zero, indicating no flow of gas in that direction. Thus, data for measuring the volume of gas passing through the orifice meter in one direction are obtained.

Should line pack pressure reverse, direction of gas flow

likewise will reverse and the gas passing through the orifice meter will be in the opposite direction.

Instead of using a beveled orifice plate, as is the usual practice for measuring gas which moves through the meter run in one direction only, a thin stainless steel, non-beveled orifice plate is used. In the case described, the thickness of the orifice plate is one-eighth inch.

With this double direction orifice meter, the volume of gas passing through the meter in either direction can be computed and the charts show at what time the direction of gas flow reversed.

Use Sawdust Bags to Protect Concrete Coating on Line

By putting sawdust instead of sand in bags used to protect the pipe coating on a weighted river-crossing line, one contractor was able to save some money and time in laying a crossing.

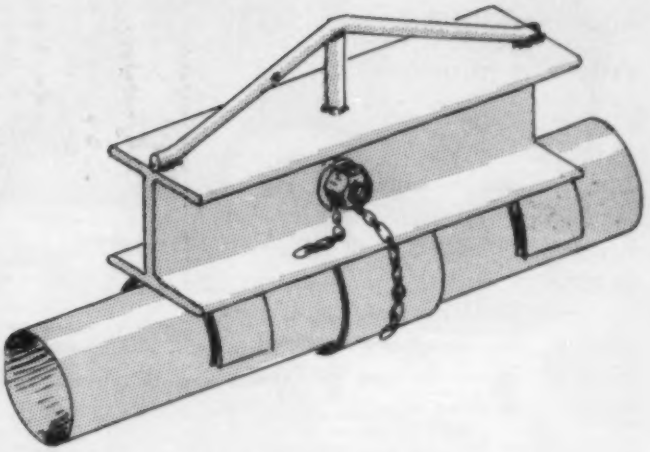
Ordinarily dirt or sand is used for this purpose and the added weight makes it more difficult to handle the bags. Also, more bags are destroyed during the operation. By using sawdust, which can be secured for no cost, the contractor saves both materials and labor.

Portable Bench Useful For Pipefitters-Painters

Here is a portable bench which could be utilized by pipefitters or painters.

Two frames are constructed of 1½-inch or 2-inch pipe by welding and are laid out at about 30 degrees or 35 degrees from vertical. Spread of the legs is required for stability and pads can be welded to the base of the legs for use on soft ground.

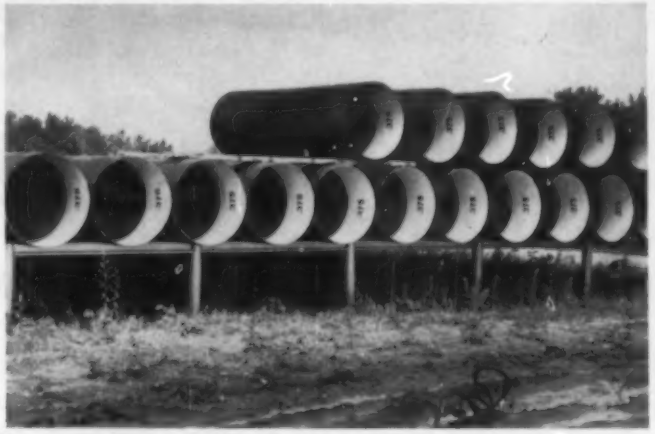
One or more 2-inch planks, depending on the desired width, completes the bench.



Protector Saves Collar When Field Line Is Bent

Take a 30-inch long, 2½-inch I-beam, weld two pipe shoes to the bottom at either end, add an adjustable chain in the middle, and you have a tool that will pay off many times in the field.

It will save the collars on field lines which are bent to conform to the ditch as they are laid. When this stiffener is not used, sharp bends will take their toll at the collars where the pipe is threaded. This handy tool can be made for about $10.



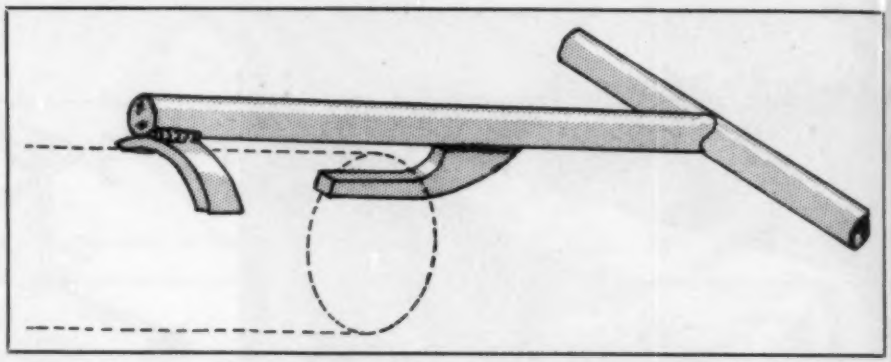
Marking Pipe on Rack Aids Identification

Paint the inside of one end of the large diameter pipe on a storage rack with bright yellow paint, stencil in the wall thickness, and save hours of confusion in the years to come.

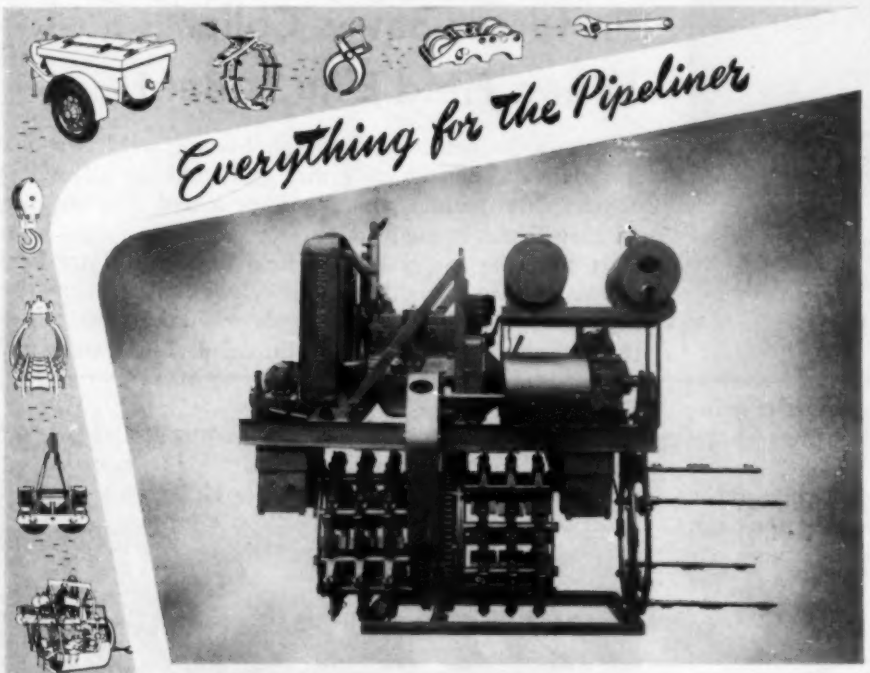
As a rule, the large diameter pipe stays on a storage rack for years before it is used. Meanwhile, it may be mixed with same size pipe which has a different wall thickness. If the pipe is not stenciled clearly and permanently, it means that each joint will have to be "miked" as it is shipped out to a job. With the advent of the Section 8 Code, it is more important than ever that proper wall pipe be installed on the line, and by "miking" the pipe and recording its wall thickness once and for all, the problem is solved.

Pipe Handling Tool Prevents Injuries

When handling pipe or tubing, especially in the larger sizes, it is sometimes difficult to obtain an adequate handhold. This is especially true when pipe has to be lifted on or off a rack or truck or carried a short distance. The pipe handling tool shown provides a safe handhold, preventing smashed fingers in case of a slip. Made from short lengths of scrap sucker rods and other scrap metals on the lease, it is light and can be carried in the tool box of the truck.



The hook that is inserted into the pipe or pipe collar is long enough so that it will be supported by the bore of the pipe and will not damage either the pin or box threads.



CLEANING & PRIMING MACHINES

Line-Traveling Over-the-Ditch or Stationary Yard and Railhead Types

Dependable machines developed through years of actual experience in serving the Pipeline Industry. Machines for every job and condition. For pipe sizes from 2" to 36". Outstanding is Perrault's Model ER machine with counter-rotating heads which cleans with any combination of knives, brushes or cutters from both directions at once. The counter-rotation reduces torque on pipe to a minimum, making operation and cradling easy. Call Perrault for a demonstration and be convinced it is best for your jobs.

ALSO: Coating and Wrapping Machines — line traveling or stationary. Tar-Heating Kettles, Patch-Pots, Burners and Accessories. Glass Pipe Wrap, Asbestos Felt Wrap, Kraft Wrap, and Rock Shield.

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Connect Blowoff Valves To Quiet Vent Lines

When the block valve and blowoff lines are near a highway or inhabited place, the lines may be connected to a standpipe away from the valves. In the one illustrated, the vent is equipped with a silencer which is also made so that no rainfall will enter the pipe.

The vent lines are connected to the blowoff valves by taking the bull plugs to the shop and welding flanged nipples on the sides. The nipples are then connected to two-inch flanged valves and tied together through a

Westinghouse announces new welder line with exclusive "wide-amp" control

Westinghouse proudly introduces a complete, new line of welding machines featuring new RA (d-c) and TA (a-c) industrial lines and a complete, new series of utility welders including an a-c—d-c machine.

Wide-Amp Control with single range on industrial rated machines provides the widest usable current range in the industry . . . a single range . . . from a soft, quiet, low-intensity arc for thin sheet metal work to an arc current well above the rated capacity of the machine for heavy jobs.

Wide-Amp Control with single range enables you to use safely these high welding currents because of *exclusive* Westinghouse De-ion® circuit breaker which constantly guards the windings against excessive temperatures.

Wide-Amp Control also provides new and *exclusive* Westinghouse adjustable ARC DRIVE CONTROL on the d-c machines; arc drive control, in turn, gives a continuous additional surge of power where needed to prevent electrode sticking and arc snuffing. Convenient *polarity reversing switch* permits easy, fast changing.

Westinghouse, the pioneer in rectifier and industrial a-c welders, continues to lead the way. Order your new welder with *exclusive* single-range WIDE-AMP CONTROL from your Westinghouse distributor or nearest Westinghouse office.

Or write for free information to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21923

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2½-inch riser which leads to the vent line. The top of the vent line is shop-made and consists of a nipple welded at right angles to the riser and two end pieces welded at a 60-degree angle so as to slant inward at the top.

This causes the rainfall to be run away from the riser. The ends of the riser are covered with a grill made from welding rods to further cut down the noise and prevent foreign bodies from entering.

Mounting Pressure Gage Minimizes Vibration

Drive an angle iron brace in the ground and mount the pressure gage on it to increase the life of the gage when it is measuring pressures inside a line subject to vibration. The gage is connected to the line by means of coiled copper tubing.

Standby Bypass Prevents Main Line Valve Damage

Shown here is a standby bypass which exactly spans the distance between the two blowoffs upstream and downstream from the station block valve. It can be used to bypass the valve when throttling is necessary. This saves the big main line valve from damage caused by high velocity gas surging into a low pressure section.

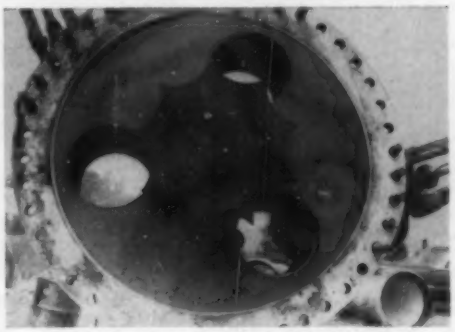
This device can be used on shutdown, pigging and testing. When not in use, the bypass is stored on a light pipe rack nearby.

Folding Cattle Guard Easy to Move

A cattle guard that may be folded up for ease in transporting from one drilling site to another can be made by the welder. The road bed part is made in the usual way using 2-inch and 4-inch pipe. The 2-inch pipe in the middle is extended to form a brace for the fence post and a short 2½-inch nipple is welded on in a vertical position. The upright fence post support is made in triangular form with another 2½-inch sleeve welded into the apex of the triangle. This sleeve must be positioned so that the 2-inch fence post will pass down through it and enter the bottom sleeve

TOPAZ cut nine coupons for this "hot" tap!

Tapping machine set up for cutting operation.



Star shaped center coupon, left after nine overlapping 12" cuts were made.

Engineers of TOPAZ and T. D. Williamson, Inc., working with Phillips Chemical Company, had the problem of tapping into Houston's industrial water supply line, (60 psi) without taking the line out of service.

The tap, needed for connecting a branch line, necessitated making a larger hole than any tapping machine could cut in one operation. It was decided to cut nine overlapping 12" coupons, making a 43" hole with a scalloped circumference.

A Model 1200 Williamson-Hillco tapping machine was used for the cutting operation. To reduce time and labor costs, three 12" gate valves were mounted on the adapter flange, allowing three cuts to be made before rotating the flange. Successful completion of this assignment serves as one example of the many ways in which TOPAZ serves the pipeline industry.

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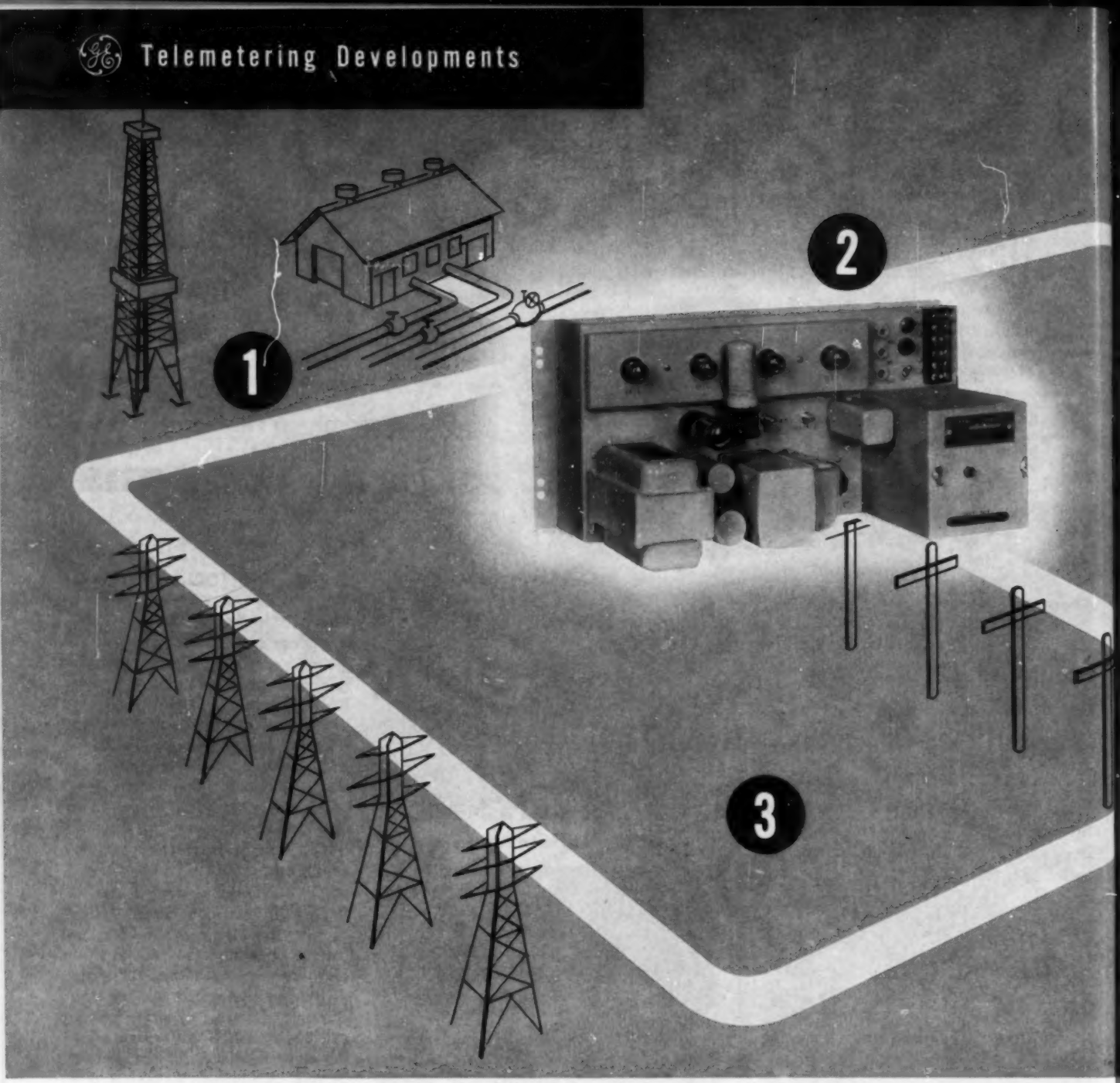
Telemetering Developments



1 **PIPE-LINE PUMPING STATION** pressures are typical quantities telemetered by General Electric equipment for indicating, recording, totalizing, or control at a remote point.

2 **TELEMETER TRANSMITTER** receives the transducer signal, converts it to a proportional frequency, and transmits it almost instantaneously with an accuracy of ±1% full scale.

NEW G-E Telemeter Transmitter

General Electric's new d-c input, frequency-type telemeter can be used with any d-c output primary detector to telemeter such quantities as pressure, flow, temperature, or other quantities important to the pipe-line industry.

IDEAL FOR CONTINUOUS READING OR CONTROL, this new addition to G.E.'s line of telemetering equipment transmits a continuous signal that combines high accuracy with fast response.

USABLE WITH ANY TYPE CHANNEL EQUIPMENT, the new Type TF-8 transmitter can be applied economically for either short or long distances.

COSTS ARE REDUCED because the TF-8 transmitter can be

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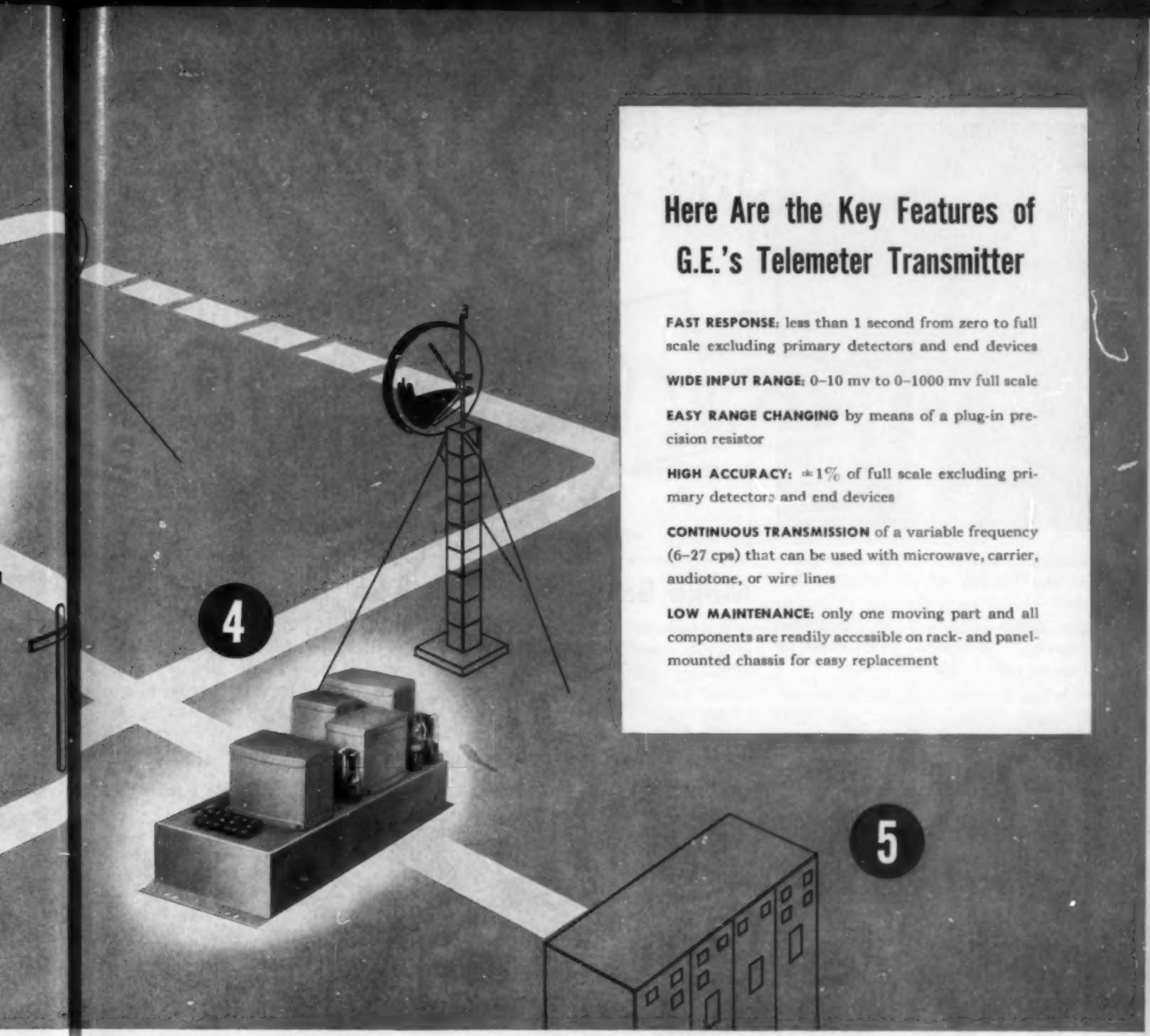

Here Are the Key Features of G.E.'s Telemeter Transmitter

FAST RESPONSE: less than 1 second from zero to full scale excluding primary detectors and end devices

WIDE INPUT RANGE: 0–10 mv to 0–1000 mv full scale

EASY RANGE CHANGING by means of a plug-in precision resistor

HIGH ACCURACY: ±1% of full scale excluding primary detectors and end devices

CONTINUOUS TRANSMISSION of a variable frequency (6–27 cps) that can be used with microwave, carrier, audiotone, or wire lines

LOW MAINTENANCE: only one moving part and all components are readily accessible on rack- and panel-mounted chassis for easy replacement

3 **CHANNELS** used with G-E telemeters may be either power-line carrier, wire lines or microwave.

4 **TELEMETER RECEIVER** converts frequency signal to a proportional d-c milliampere or millivolt output.

5 **END DEVICE** may be an indicating or recording d-c milliammeter or millivoltmeter (potentiometric type).

Gives Fast Response, 1% Accuracy

paralleled with existing potentiometric recorders eliminating the need of an additional primary detector for telemetering.

BUILT-IN TEST FACILITIES are provided by the new G-E transmitter so that the operation of channel equipment as well as the telemeter receiver and end device can be easily checked.

FOR MORE INFORMATION or application assistance, contact your nearest General Electric Apparatus Sales Office or mail the coupon.

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Schenectady 5, N. Y.

Please send me a copy of your new bulletin describing G.E.'s complete line of telemetering equipment, GEA-5233.

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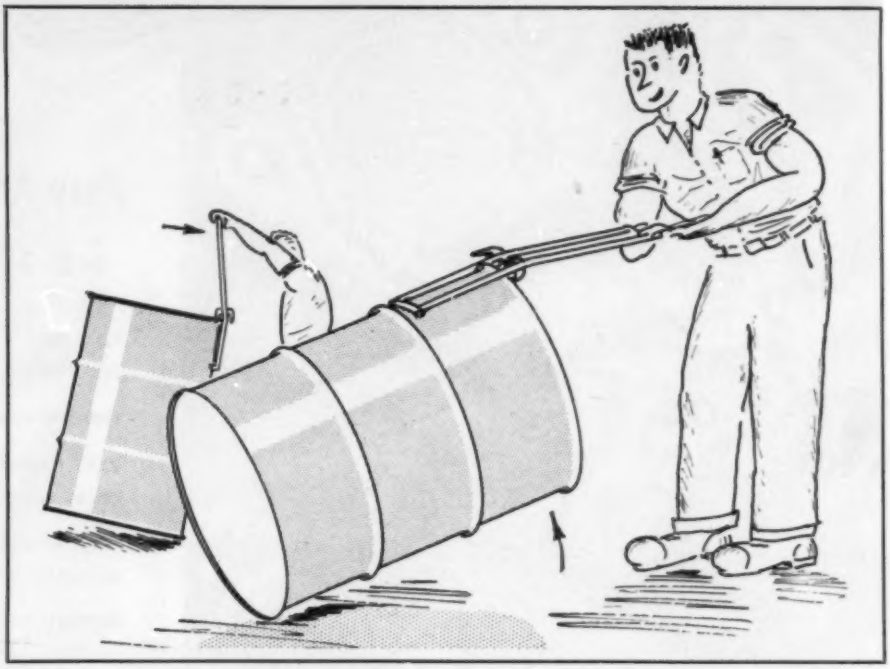
ADDRESS .....

CITY ..... ZONE ..... STATE .....

welded to the brace. The cross piece at the bottom of the triangle has three sleeves on it that are welded to the 2-inch members of the guard grating. The bottom piece must be free to turn inside the sleeve.

When disassembling, the fence wire is removed, the fence posts are lifted out of the sleeves, and the braces are folded in onto the guard grating.



Make Barrel-Handling Tool from Scrap

A simple device can be constructed of scrap metal to aid in the handling of heavy drums. Made of ⅝-inch sucker rods, the device has two sets of lugs welded to the rods that catch under the lip of the barrel and enable one man to lower or lift heavy drums by providing an adequate handhold. The rods are bent slightly to facilitate lowering the drum or raising it to an upright position. The handle also is long enough so that two men, one on either side, can handle the drum if necessary.

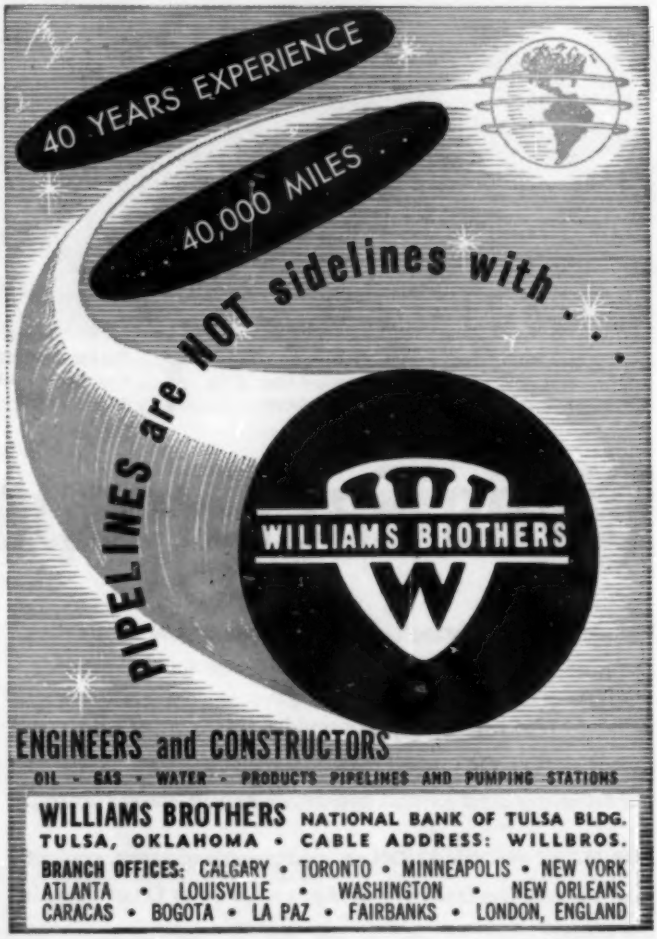
STANDARD OF THE INDUSTRY . . .
for cutting steel or cast iron pipe . . .

THE
ALSTON
Rachet
PIPE CUTTER

There's none better for SPEED, SAFETY, POWER, ACCURACY and ECONOMY. It eliminates dangerous sparks . . . broken cutters; rollers hold pipe taut after cutting. It's easy on and off pipe . . . will cut 10" pipe in 12 min. Patented roller guides. Rachet makes it easy to work in close places.

A size for every requirement . . . write for details, literature and prices.

ALSTON MANUFACTURING COMPANY
P. O. Box 707 Phone 226
LIVINGSTON, TEXAS


40 YEARS EXPERIENCE
40,000 MILES
PIPELINES are NOT sidelines with . . .
WILLIAMS BROTHERS
ENGINEERS and CONSTRUCTORS
OIL • GAS • WATER • PRODUCTS PIPELINES AND PUMPING STATIONS
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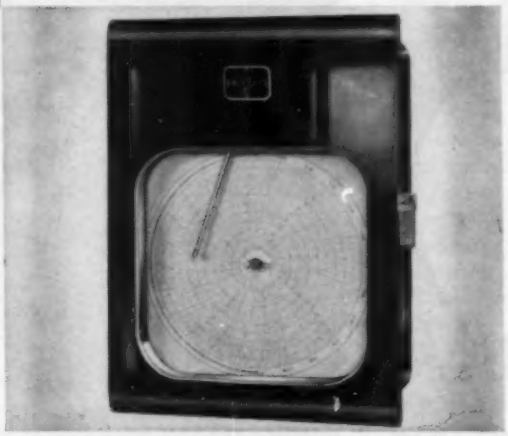
CARACAS • BOGOTA • LA PAZ • FAIRBANKS • LONDON, ENGLAND

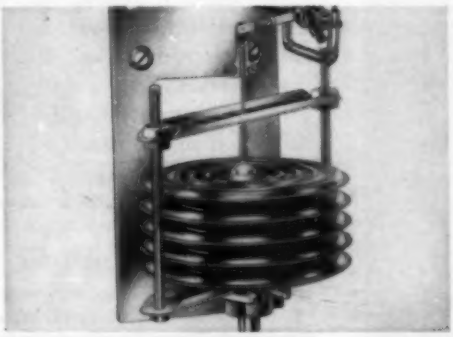
How much do you know about Recording Pressure Gauges?

1 **Q.** Why are more Bristol Recording Gauges used than all others combined?



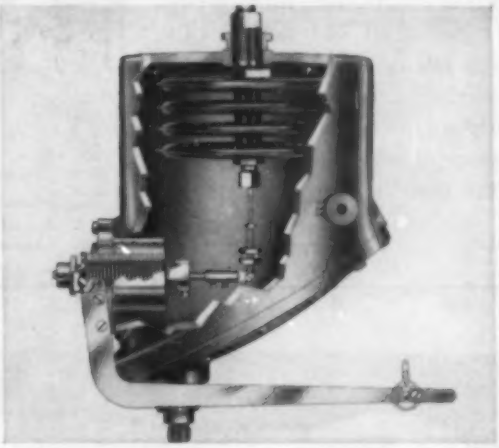
A. BRISTOL'S PRESSURE MEASURING ELEMENT, heart of the pressure gauge, is the big reason. Bristol Pressure Gauges, operating all over the world under all conditions – some in constant service for 20, 30, even 40 years – prove its accuracy, long life, and stability.

2 **Q.** What's the *right* measuring element for low pressure ranges?



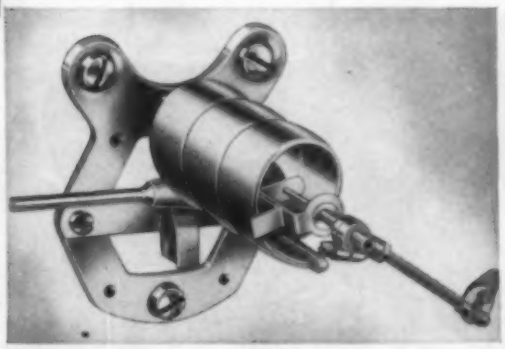
A. BRISTOL'S DIAPHRAGM MEASURING ELEMENT, for ranges from 0–2 in. water to 0–29.9 psi. Extremely high torque gives positive pen positioning across entire range. It's highly accurate, extremely stable. 250% inherent over-range protection.

3 **Q.** What's the *right* measuring element for absolute pressures?



A. BRISTOL'S SINGLE-BELLOWS TYPE ELEMENT. It measures ranges as low as 0–6mm mercury absolute and gives direct reading of pressure above absolute zero corrected for barometric variations – with far greater accuracy than ever before.

4 **Q.** For intermediate and high pressures?



A. CORRECT ANSWER here is either Bristol's *Type 316 stainless steel* or *non-ferrous alloy* helical measuring elements. They're designed for ranges from 0–30 psi all the way up to 0–10,000 psi. Withstand impact of rapid fluctuations, give *permanent* accuracy over a long period of service life.

What do you get for the right answers? A free copy of our 32-page catalog G621. It tells all about Bristol Recording Gauges for recording, automatic controlling, pneumatic transmission and telemetering. Write for it today. The Bristol Company, 114 Bristol Road, Waterbury 20, Conn. 5.21

BRISTOL'S

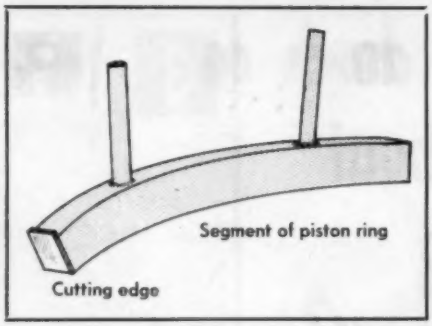
BRISTOL

POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION

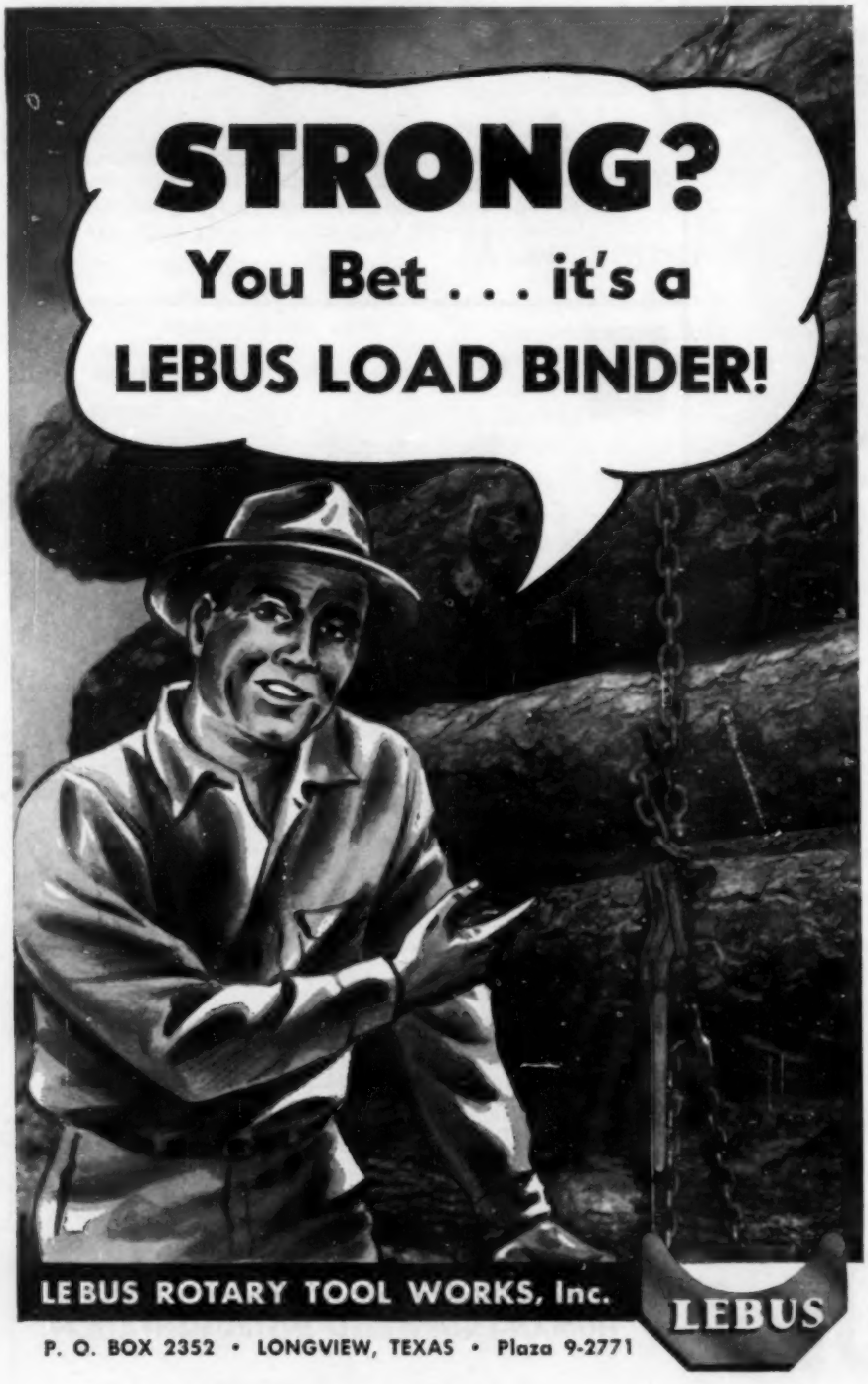
AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Piston Ring Groove Cleaner Is Easily Made

To make a piston ring groove cleaner from an old piston ring, simply cut out an eight-inch segment of an old ring, and weld two handles to it. Add a cutting edge made from an old piece of highly-tempered band saw. This piece should be machine sharpened and then brazed to the piston ring segment.



To use this tool, simply run it around the groove; carbon and glaze will peel right off.



Cardboard Tags Aid Warehouse Bookkeeping

Small metal-ringed cardboard tags looped onto each item in the warehouse make it simple to keep up with material as it is issued. Each tag bears the stock number and location of the material; and as the material is issued, the tag is simply looped over a hook as shown in the illustration.

Periodically they are gathered up, entered in the stock records, and from these, orders are replenished. This simplifies warehouse bookkeeping.

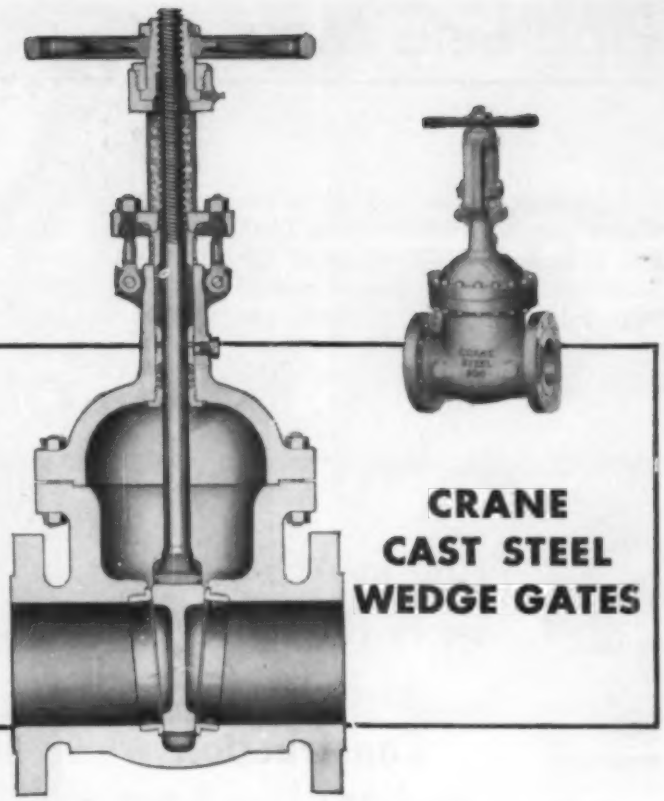
Use the Readers' Service Cards

For more information on new equipment, for copies of the literature reviewed or for data on advertised products in this issue, use the Readers' Service Cards inside the back cover. Circle the editorial or advertising code numbers; sign and mail the card. The information will be mailed directly to you from the manufacturer.

let valves of
known dependability
keep your piping costs
in line

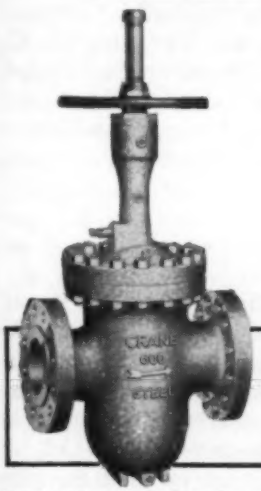
CRANE

Here are some of the most famous valves in pipeline service—famous for their greater suitability, dependability, and long-range economy. The consistent success of Crane pipeline valves is easy to understand when you consider the background . . . dating clear back to the early days of the petroleum industry.



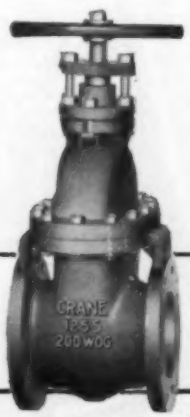
CRANE CAST STEEL WEDGE GATES

The pioneer steel valve that has never been topped in quality and performance. A stronger and more rugged valve because of Crane skill in steel casting. Dependable wedge gate design with solid wedge-type disc. Long, close-fitting guides assure accurate seating—minimize wear. Crane *Exelloy* trim on all seating surfaces provides the resistance you want against erosion and wear. Deep, lantern-type stuffing box assures tightness and long packing life. Crane Cast Steel Wedge Gates are available in a wide range of sizes with flanged and welding ends; 150, 300, and 600 lb. class.



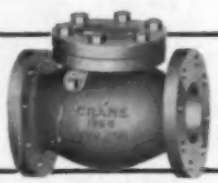
CRANE CONDUIT-TYPE GATES
CLASS 600

Even infrequent operation won't affect their efficiency, for all working parts are sealed in grease. Dual-seating double disc is fully seated in open as well as closed position, thereby solving erosion problems. Conduit-type disc ports coincide exactly with seat openings for smooth, clear flow with minimum pressure drop. Full-Way or Venturi patterns for working pressures up to 1440 pounds, oil or gas. Sizes 2 to 30 inch.



CRANE IRON BODY WEDGE GATES

You see plenty of these dependable 125-pound Crane valves along the nation's pipelines. Adaptable for all types of services, they feature an exceptionally strong oval-shaped body and bonnet. Available with either double disc or solid wedge disc. OS&Y and non-rising stem patterns, brass trimmed or all-iron. Screwed or flanged end valves available. Complete range of sizes.



CRANE IRON BODY SWING CHECKS

Well-proportioned, sturdy valves, globular in shape to provide ample flow. *The disc cannot stick in open position.* All-iron or brass trimmed, whichever your service demands. All-iron valves have seating surfaces cast integral with body and disc. Seat ring in brass-trimmed valves is screwed into the body. All sizes have the hinge suspended in the body, permitting simplified change-over to outside lever and weight. Sizes up to 24 inch.

THE BETTER QUALITY . . . BIGGER VALUE LINE . . . IN BRASS, IRON, STEEL

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

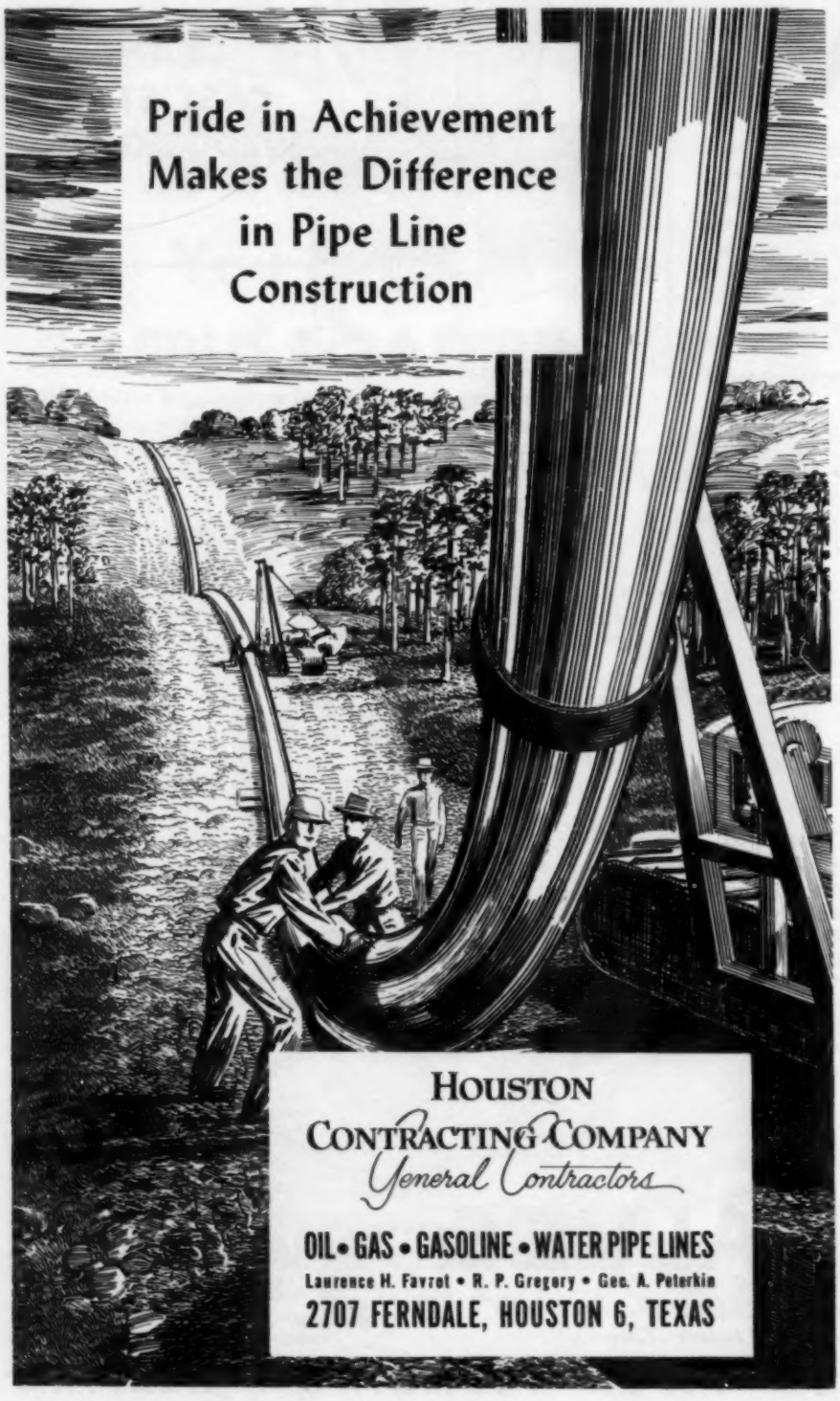
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

For more data on advertised products, use Readers' Service Cards, last page.

Pipe Line Men

IN THE NEWS

Edward G. Boyer, manager of the Gas department, Philadelphia Electric Company, was recipient of the **American Gas Association's** annual Beal Award, presented to the author of the most outstanding technical paper during the past year. The award was made at the AGA meeting in Los Angeles. Boyer has won the award twice previously and received the honor this year in recognition of his paper "The Manufactured Gas Position in Present Day Operation."


Pride in Achievement
Makes the Difference
in Pipe Line
Construction
HOUSTON
CONTRACTING COMPANY
General Contractors
OIL • GAS • GASOLINE • WATER PIPE LINES
Laurence H. Favrot • R. P. Gregory • Geo. A. Peterkin
2707 FERNDALE, HOUSTON 6, TEXAS

Guy W. Wadsworth, Jr., president and general manager of Southern Counties Gas Company, Los Angeles, was elected president of the **Pacific Coast Gas Association** at the annual convention held in Los Angeles in October. **T. T. Arden,** Robertshaw-Fulton Controls Company, Long Beach, was elected vice president and **Harry McGann** of Pacific Gas and Electric Company, San Francisco, was elected treasurer of the PCGA.

G. W. Wadsworth, Jr.

Four directors selected by the Pacific Coast group to serve two year terms are **Grove Lawrence,** Southern California Gas Company, Los Angeles; **H. L. Purdy,** British Columbia Electric Company, Vancouver, B. C.; **J. D. Roberts,** Mountain Fuel Supply Company, Salt Lake City, Utah; and **C. H. Webber,** Tucson Gas Electric Light and Power Company, Tucson, Ariz.

•

Russell W. Bowers, has been named treasurer of **Sun Pipe Line Company** where he also is manager of operations and director. **William S. Woods, Jr.,** an administrative assistant in the Treasury department of Sun Oil, becomes assistant treasurer of the pipe line to succeed Bowers. Woods retains his former duties in Sun Oil Company. Both appointments follow the retirement of **Arthur H. Russell,** former treasurer.

•

Bruce A. McCandless, formerly assistant to the managing director of the **American Gas Association,** has been appointed an assistant managing director. McCandless joined the A.G.A. Staff in New York in 1952 as assistant to the managing director, later serving as acting assistant managing director. Previously he was assistant to the director of the A.G.A. laboratories in Cleveland.

For more data on advertised products, use Readers' Service Cards, last page.

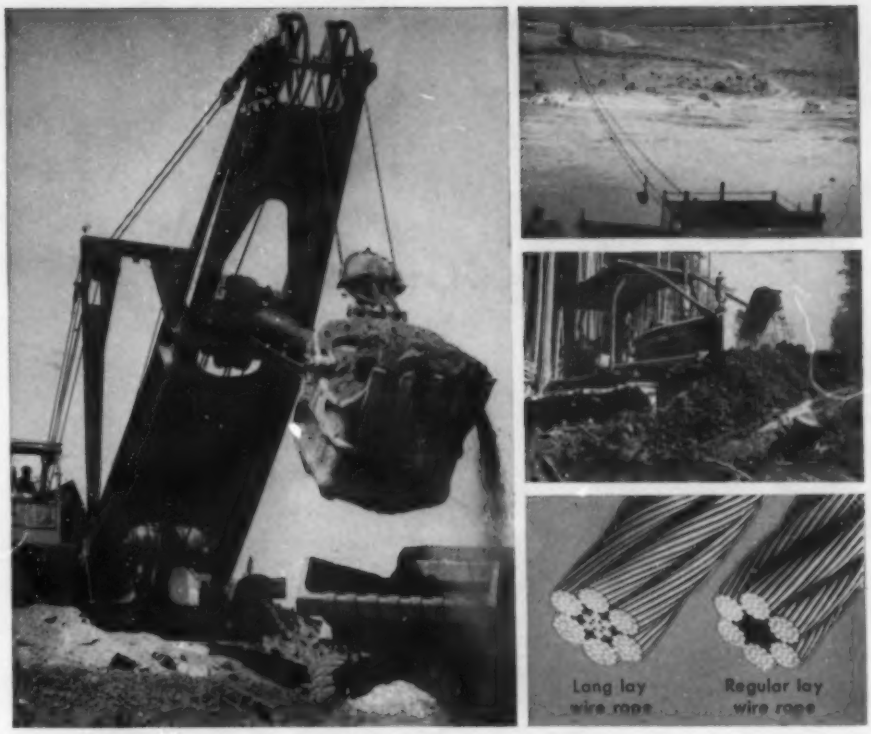
Dean H. Mitchell

C. H. Zachry

Dean H. Mitchell, president of Northern Indiana Public Service Company, Hammond, Ind., was elected president of the **American Gas Association** at the annual convention in Los Angeles. Other officers are C. H. Zachry, president of Southern Union Gas Company, Dallas, first vice president; A. W. Conover, president of Equitable Gas Company, Pittsburgh, second vice president; and Vincent T. Miles, treasurer of Long Island Lighting Company, Mineola, N. Y., treasurer of AGA.

A. W. Conover

Fifteen executives from gas utility, pipe line and appliance manufacturer companies elected directors of AGA for two year terms include: M. A. Abernathy, vice president, United Gas Pipe Line Company, Shreveport; P. E. Beckman, vice president, Pacific Gas & Electric Company, San Francisco; R. E. Crawford, president, Minnesota Valley Natural Gas Company, St. Peter, Minn.; Lyle C. Harvey, senior vice president, Carrier Corporation, Syracuse, N. Y.; John E. Heyke, Jr., president, The Brooklyn Union Gas Company, Brooklyn, N. Y.; D. E. Karn, president, Consumers Power Company, Jackson, Mich.; Wister H. Ligon, president, Nashville Gas Company, Nashville, Tenn.; Chester L. May, senior vice president, Lone Star Gas Company, Dallas; Robert W. Otto, president, Laclede Gas Company, St. Louis; F. T. Parks, vice president, Public Service Company, of Colorado, Denver; J. C. Peterson, president, The Manufacturers Light & Heat Company, Pittsburgh; W. F. Rockwell, Jr., president, The United Gas Improvement Company, Philadelphia; J. Theodore Wolfe, executive vice president, Balti-



What extra good will Leschen Lang lay wire rope do for you?

Look at a length of Lang lay wire rope. Compare it with regular lay. Notice that the *wires* in Lang lay rope twist in the *same* direction as the *strands*. In regular lay rope these directions are opposite.

What does that do? It makes the exposed length of the outer wires in Lang lay rope about twice as long as in regular lay rope. It has extra bearing surface to withstand wear from scuffing, rubbing and other abrasive action. Also, because Lang lay wires and strands are laid in the same direction, the rope has greater flexibility.

What's the result? Simply this—on some types of duty, where abrasive and bending stresses are abnormal, Leschen Lang lay rope definitely lasts longer than regular lay. Replacements are fewer. Costs are lower. And, with Leschen you are assured of *higher-than-rated quality* for *longer-than-expected wire rope service.*

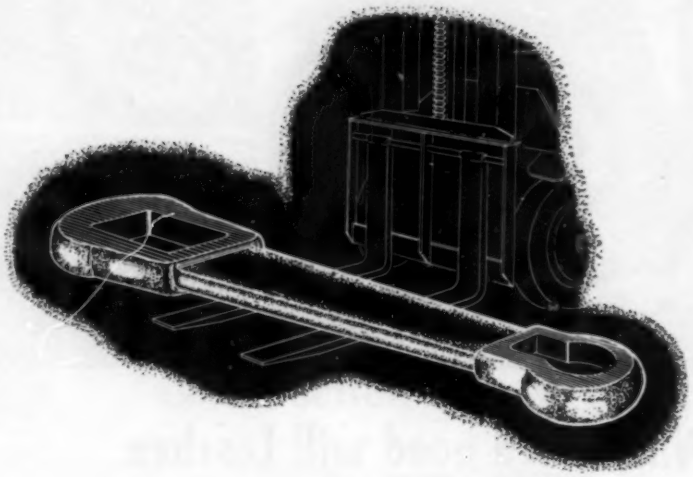
Can you use these benefits? To make sure, ask your Leschen man. Leschen makes all types of Red-Strand wire rope for all types of jobs, and can help select the best one for you. Perhaps you *should* use Lang lay. Talk to him soon.

Depend on Leschen's higher-than-rated quality for longer-than-expected service.

LESCHEN
HERCULES *Red-Strand*® WIRE ROPE
LESCHEN WIRE ROPE DIVISION
H. K. PORTER COMPANY, INC.
St. Louis 12, Missouri
HKP

For more data on advertised products, use Readers' Service Cards, last page.

Worn? Mismachined?



VANDERLOY*

is the answer.

Connecting rods, power cylinders, shafts, rods—i.d. or o.d. surfaces—all can be restored to design dimensions by the application of VANDERLOY.

VANDERLOY* **an electrolytic iron that bonds atomically with most ferrous metals, aluminum, copper, nickel and their alloys.**

Write for additional information on this NEW reclamation service.
Dept. PL-2, VAN DER HORST CORPORATION, Olean, N. Y.

VAN DER HORST

TERRELL, TEXAS
OLEAN, NEW YORK
LOS ANGELES, CALIFORNIA**
HILVERSUM, HOLLAND

*Patents applied for

**SparTan Engineering
West Coast Licensee

more Gas & Electric Company, Md.; and D. K. Yorath, general manager Northwestern Utilities, Ltd., Edmonton, Alberta, Canada.

•

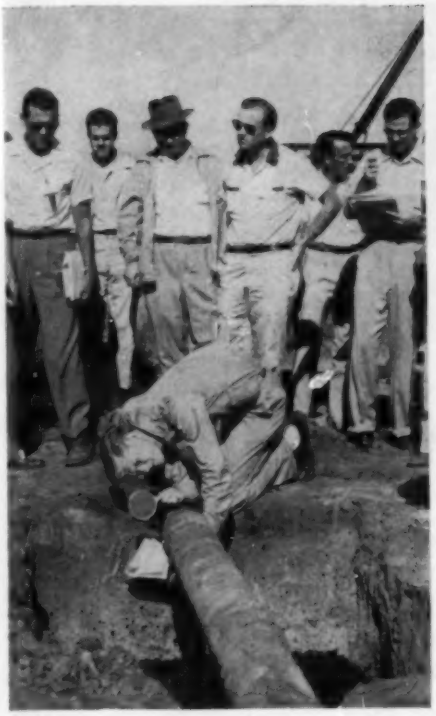
Dr. James Edward White has been appointed supervisor of the physics section of **The Ohio Oil Company's** Research Center, now under construction. Other research department heads at the center are: Geology section, **Dr. R. Dana Russell;** Chemistry section, **Dr. Louis C. Gibbons;** and Engineering section, **Dr. Fred H. Poettmann; W. H. Barlow,** manager of research for Ohio Oil, is located at the general offices in Findlay, Ohio.

White was director of the M.I.T. Underwater Sound laboratory in 1944 and 1945 and worked for the Defense Research Laboratory at the University of Texas in 1946. From 1949 to 1955 he was in charge of geophysics research at the Field Research Laboratories of Magnolia Petroleum Company.

•

Seven men, designated for elevation to the highest rank of membership in The American Society of Mechanical Engineers, are: **Joseph Bradley Armitage,** vice president in charge of engineering, Kearney & Trecker Corporation; **James H. Doolittle,** vice president and member of the executive committee, Shell Oil Company; **Samuel Broadus Earle,** dean of the School of Engineering and director of the Engineering Experiment Station, Clemson College; **Simes Thurston Hoyt,** consulting engineer, Castle & Cooke, Ltd.; **Carl George Arthur Rosen,** consulting engineer, Caterpillar Tractor Company; **Philip Sporn,** president of American Gas & Electric Company; and **Clyde Elmer Williams,** president of Battelle Memorial Institute.

Honorary membership, conferred for acknowledged eminence in the engineering field, has been awarded to only 177 persons since ASME's founding in 1880. Among the group are Dwight D. Eisenhower, Ralph E. Flanders, Herbert C. Hoover, Andrew Carnegie, Thomas A. Edison and George Westinghouse.



NACE Holds Tour

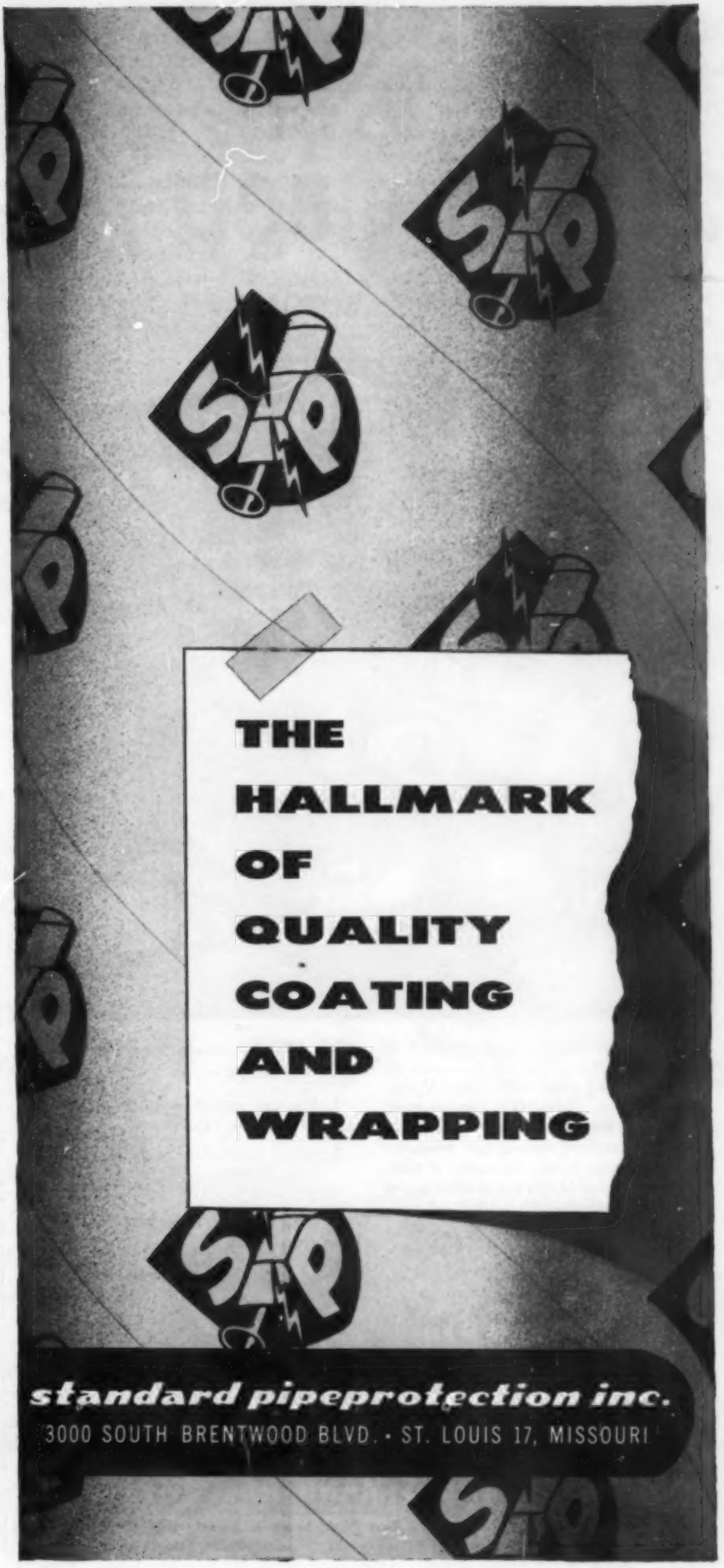
Over 60 exhibits of corrosion inhibition projects on 15 types of oil field and refining equipment were on display during the Sixth Biennial Permian Basin Corrosion Tour held in Odessa, Texas, October 12-14. Shown inspecting a pipe line cut are some of the 150 persons who participated in the three-day event sponsored by the Permian Basin Section of the National Association of Corrosion Engineers.

Appointment of **Norman R. Wyckoff** as superintendent of **Southern Counties Gas Company's** Texas Pipeline division has been announced. Most recently construction and maintenance supervisor in the San Gabriel Valley division, he has had extensive background in pipe line construction and maintenance. He joined the company in 1939.

In his new post, Wyckoff will have charge over Southern Counties' Texas pipe line system extending from the Colorado river near Blythe to the Los Angeles metropolitan area.

•

L. C. Foy, former assistant division manager of the Mid-Continent crude oil pipe line division of **Sinclair Pipe Line Company,** has been named assistant general manager of crude oil lines. He will assist J. D. McConnell, general manager, in supervision and administration of all the company's crude oil pipe lines. **Ralph W. Sexton,** assistant district superintendent of the company's Great Bend, Kansas, crude oil lines operating district, will succeed Foy as assistant manager of the Mid-Continent division.



Eleven employes of **Sinclair Pipe Line Company** received the Joseph A. Holmes Safety Association certificates of honor for outstanding individual safety records. Each of the recipients has worked 40 years or more on crude oil pipe lines maintenance or operations without incurring a lost time accident. Recipients were Charles E. Booth, Paola, Kansas; John R. Beeson, Bartlesville, Okla.; Michael J. Ohmes, Greeley, Kansas; Newton A. Banks, Sedan, Kansas; Vern C. Campbell, Drumright, Okla.; John A. Glynn, Great Bend, Kansas; Walter F. Polston, R. J. Tibbets, Fred A. Crane, and Henry S. Darby, all of Independence, Kansas; and Claude C. Riley, Virgil, Kansas.

A similar presentation was made recently at Quincy, Ill. to six Sinclair Pipe Line Company employes. They were Donn J. Chalfant, Griffith, Ind.; Leonard E. Westlake, Quincy, Ill.; Jesse A. Shibley, Salisbury, Mo.; J. E. Tribbey, Quincy; Harry F. Rogers, Wilmington, Ill.; and William H. Chatham, Kernan, Ill.

•

D. R. Pflug has been appointed vice president and chief engineer of **Trans-Canada Pipe Lines Limited.** Pflug joined Trans-Canada Pipe Lines Limited in 1954 as chief engineer, coming to Calgary from Shreveport, where he was chief engineer and later superintendent of operations for United Gas Pipe Line Company.

D. R. Pflug

•

The Pure Oil Company recently announced the transfer and promotion of **A. E. Harnsberger** to the newly-created position of general manager for transportation and supply. He will be responsible for administration and supervision of departments such as crude and product supply, crude oil purchasing, pipe lines, marine, terminals, traffic and motor transport.

Harnsberger joined Pure Oil in 1924 and, during the years, has been engaged primarily with activities of the Refining division. He was promoted from manager of the Refinery Technical department.

•

Ed Parkes, Shreveport, has been elected a director and vice president and general manager of **United Gas Corporation.** He succeeds the late **M. A. Abernathy.** Parkes, who has been with United Gas and a predecessor company for more than 27 years, has been a director of the firm's transmission subsidiary, United Gas Pipe Line Company, since 1946 and vice president of that company since 1947.

Parkes was graduated from the University of Arkansas prior to joining a company which later became a part of the United Gas system. After three years as assistant superintendent and district superintendent for the firm in Bastrop and Monroe, La., he entered the company's general offices as assistant to the production superintendent. Three years later he was named assistant general superintendent of pipe lines and became general superintendent of field pipe lines in 1937.

95% to 99%
noise energy eliminated in Gas Regulation

BURGESS-MANNING PRS SILENCERS
are designed to stop nerve-wracking noise caused by pressure reduction operations in gas regulation.

The PRS Silencer in the photograph is installed in the gas regulator system of the gas mixing plant at the Lehigh Valley Gas Division, United Gas Improvement Company, Bethlehem, Pennsylvania. This regulator reduces natural gas pressures from 45 psig. to approximately 2 psig. Sound Surveys at this installation prove the PRS Silencer—

- Removes 95% to 99% of the noise energy.
- Reduces noise levels at critical outside locations by 18 to 25 db.
- Eliminates the need for expensive pipe lagging.

With PRS Silencers you *gain* in *two big* ways—

1. Pressure reduction silencing with predictable results.
2. Initial savings in installation time and material.

. . . PRS Silencers do not restrict line flow.

They can be designed for any pressure range.

They require no major modification in practice.

We offer you a specialized experience and engineering service

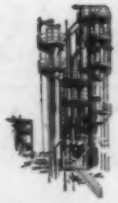
Ask for your free copy of engineering reports

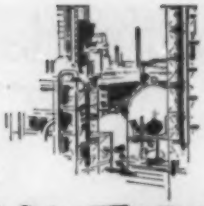
Sound Engineering

BURGESS-MANNING COMPANY

713 East Park Avenue, Libertyville, Illinois
Dallas, Texas

VERSATILE STAYNEW LIQUID FILTERS

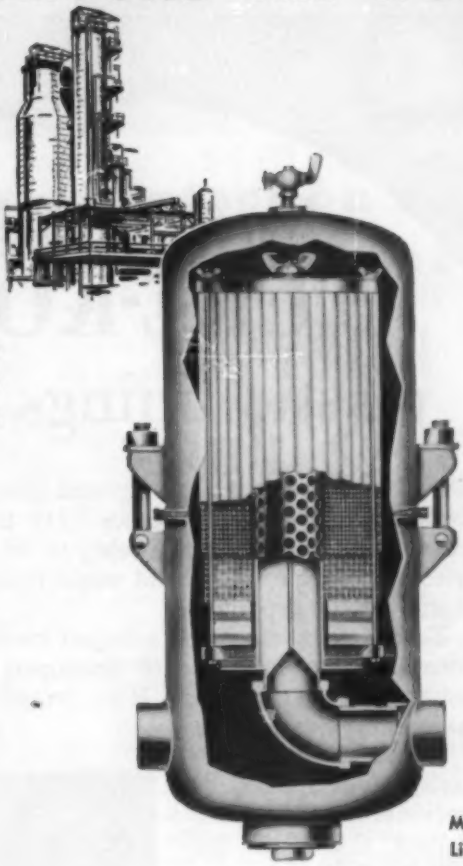




For Oils, Water, Chemicals, Coolants

SOLVE FILTERING PROBLEMS AROUND THE WORLD

PRACTICALLY any liquid can be efficiently and economically filtered by a Staynew Liquid Filter. They are designed for adaptation to virtually any space requirement or any arrangement of inlet and outlet connections. All known types of filtering media are available to provide any degree of efficiency for any specific problem, or for use regardless of temperature, pressure or corrosion requirement. All units can be constructed according to the API-ASME and the various ASME Code specifications. Staynew Model ELS liquid filters are available in many types of materials other than regular steel, such as stainless steel, monel, herculoy and other non-corrosive materials.



MODEL ELS
Liquid Filter

PARTIAL LIST OF LIQUIDS THAT CAN BE FILTERED BY STAYNEW LIQUID FILTERS

Acetone	Emulsions	Molasses
Acids	Enamels	Naphtha
Adhesives	Ethanolamine	Paint
Alcohols	Ethylamine	Pharmaceuticals
Alkalis	Extracts	Propylene
Ammonia	Flameproofing Solutions	Quenching Oils
Asphalt	Fuel Oil	Resins
Benzene	Furniture Polish	Rubber Cements
Benzine	Gasoline	Sizing
Beverages	Glue	Soap
Butane	Greases	Solvents
Casein	Gums	Steam Condensate
Castor Oil	Hydraulic Fluids	Syrups
Caustic	Ink	Tar
Cellulose Solutions	Kerosene	Turpentine
Chlorine	Lacquers	Varnish
Chocolate	Latex	Vegetable Oils
Cleaning Fluids	Liquid Paraffin	Viscose
Coating	Lubricants	Water
Coolants		Wax
Cutting Oils		

SEND for this 12-page bulletin D-IL containing specifications, engineering and performance data, photos and descriptions of recommended types of filter media, check list of liquids that can be filtered and other helpful data.

DOLLINGER PROTECTO-MOTOR STAYNEW FILTERS

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ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

What's Happening

AMONG SERVICE AND SUPPLY MEN

Ralph G. Griffin Heads Worthington District Office

Ralph G. Griffin has been appointed manager of Worthington Corporation's Cincinnati district office.

Griffin joined Worthington in 1930 as a student trainee after graduating from Northeastern University as a mechanical engineer. He later served as application engineer at the company's St. Louis district office and at the Buffalo district office.

From 1936 to 1953 Griffin worked the Buffalo territory as salesman in general line, merchandising, air conditioning and refrigeration. He became assistant manager of the Cincinnati district office in 1953.

Griffin succeeds Earle W. Vinnedge, now special representative of the Cincinnati office.

Research makes
TUBE-KOTE
plastic linings BEST

Tube-Kote pioneered the use of plastic linings for pipe and other tubular oil field equipment. Since 1939 they have maintained a research laboratory devoted solely to developing, testing, and perfecting plastic formulas that would really combat corrosion, prevent paraffin deposition.

Tube-Kote is the world's largest company putting all its efforts in the one purpose of developing and manufacturing plastics for use in the oil field. It is a proved fact that Tube-Kote plastic linings—made best by research—and Tube-Kote's unique method of application of plastic to steel CANNOT BE DUPLICATED.

One end of the huge battery of bake ovens where Tube-Kote plastic linings are bonded to the metal. Electronic control keeps temperature within 1%.

TUBE-KOTE T.M. Reg.

Factory trained, field service engineers are available for consultation in all principal oil areas. Write today for free literature.

TUBE-KOTE, INC.

P. O. Box 20037 • Houston 25, Texas

New Tube-Kote Sales Manager To Supervise Southwest Area

Lynn C. Edgar, recently appointed sales manager of Tube-Kote, Inc., will supervise activities of the company's sales engineers in a seven-state Southwestern area and personally will service Tube-Kote customers in the North Texas region. He also will direct regular technical staff meetings on solving corrosion and paraffin deposition problems.

Lynn C. Edgar

A sales engineer with Tube-Kote seven years, Edgar formerly was with Humble Oil Company's Baytown Laboratory Testing division.

Felix Named Vice President Of De Laval Turbine Pacific

Samuel P. Felix, general manager of the De Laval Turbine Pacific Co., was named vice president by a recent meeting of the board of directors. Turbine Pacific is a wholly-owned subsidiary of De Laval in Trenton. Felix, in addition to his new post as vice president, will continue to serve as general manager.

De Laval Turbine Pacific has recently begun operations in a new $400,000 sales and service center in Millbrae, Calif., an industrial area near San Francisco.

Felix joined De Laval in 1939 as a test engineer at the Trenton plant. He later served in various production and supervisory capacities. In 1941, he assumed charge of the standard products machine shop. In 1949 he was appointed a plant superintendent in Trenton, and was appointed to his present position as general manager of Turbine Pacific four years later.

Walker Succeeds Rukgaber In General Motors Post

Frederick W. Walker, Jr., has been appointed manager of the Chicago region of the Electro-Motive division of General Motors. He succeeds George W. Rukgaber, recently transferred to the locomotive division of General Motors Overseas Operations, New York.

Walker, who has been industrial sales manager of Electro-Motive, is succeeded by D. H. Queeney, general service manager. Frederick T. Battey, manager of technical services, is replacing Queeney as general service manager.

Also announced were the recent promotions of R. J. Hondlik, branch sales manager at Robertson, Mo., and J. E. O'Leary, regional service manager, St. Louis, as district sales managers in the St. Louis region.

Philip Scott Named Assistant To President of Byron Jackson

Philip W. Scott has been named to the special post of assistant to the president of the Byron Jackson division of Borg-Warner Corporation. Scott has been an executive in Borg-Warner's headquarters at Chicago and had an important part in negotiating the recent merger between Byron Jackson and Borg-Warner.

Philip W. Scott

Before joining Borg-Warner, Scott was vice president, secretary and treasurer of the Affiliated Gas Equipment Company in Cleveland, Ohio.

Jones & Laughlin Breaks Ground for New Building

Ground-breaking ceremonies for the construction of a new $1,500,000 headquarters building for the Supply division of Jones & Laughlin Steel Corporation were held in Tulsa in November.

C. L. Austin, president of Jones & Laughlin, turned the first spade of dirt. Others on the program were Rainey Elliott, Tulsa, president of the J & L Supply division; John E. Timberlake, Pittsburgh, J & L's vice president, sales; Russell Rhodes, executive vice president, Tulsa Chamber of Commerce; Maurice Sanditen, president of the Tulsa Chamber of Commerce; and other officials of the J & L Supply division.

The new building is a part of the firm's expansion program. Last week, the corporation announced that it would spend more than $250 million in improvement and expansion in the four-year period 1955-1958. This would increase J & L's annual ingot capacity over 700,000 tons. Present annual ingot capacity is about 6,200,000 tons.

The new supply division building will be a modernistic brick structure containing more than 100,000 square feet of floor space. It will consist of an air-conditioned office and a large warehouse, with a file storage area in the basement.

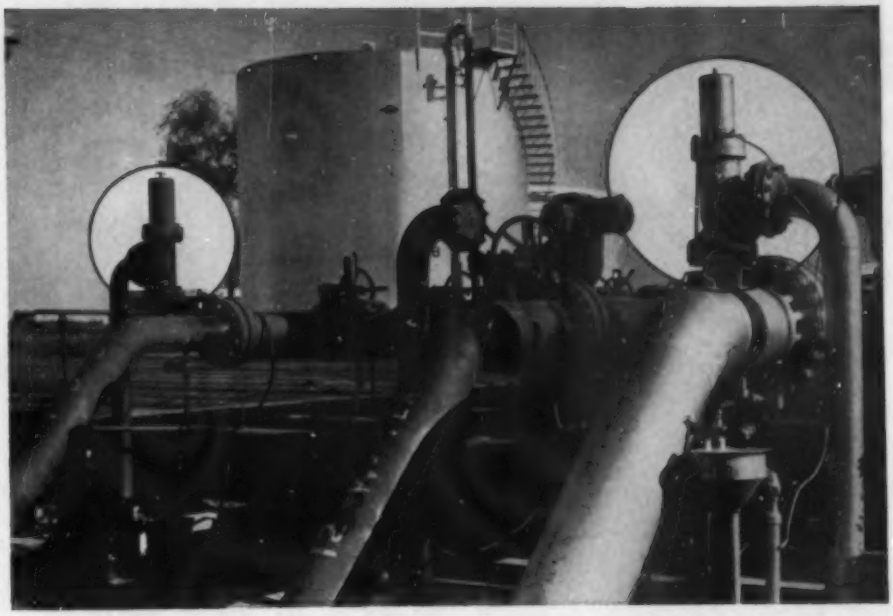
International Harvester Names Don Sandford to New Position

Don B. Sandford has been appointed manufacturer sales representative, Industrial Power division for International Harvester Company, covering Texas and Oklahoma.

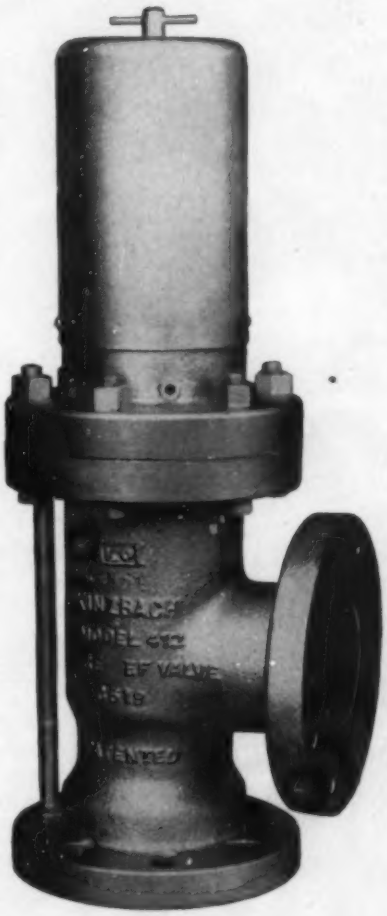
Sandford, a 21-year employe of International Harvester, has spent his entire service with the company in engineering design and sales engineering. For the past ten years he has been active in oil field preparations. His headquarters will be in Dallas.

Oil Well Supply Announces Gulf Coast Staff Changes

Two field representatives in the Gulf Coast area of United States Steel's Oil Well Supply division have been announced. James S. Necessary, formerly store manager at New Iberia, La., is field representative at Lake Charles and Robert E. Beattie, manager of the Houma, La. store, becomes field representative at Beaumont, Texas.



Positive Protection Against Pressure Surges



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MODEL 412
RELIEF VALVE
for Pipelines and Refineries

When a pressure overload in the line is reached, the Kinzbach Model 412 Relief Valve opens instantly to full capacity. This valve provides automatic resetting at a pre-determined pressure drop, positive seating and facilities for functional testing.

The Model 412 uses line pressure for opening and closing. The opening pressure is preset by application of a dead weight load. Opening and closing action is positive and reliable. The pre-set pressure never changes.

Kinzbach Model 412 Relief Valves are available in 2", 3", 4", 6" and 8" sizes for working pressures up to 1000 p.s.i. Write for Bulletin RV412 for full technical data.

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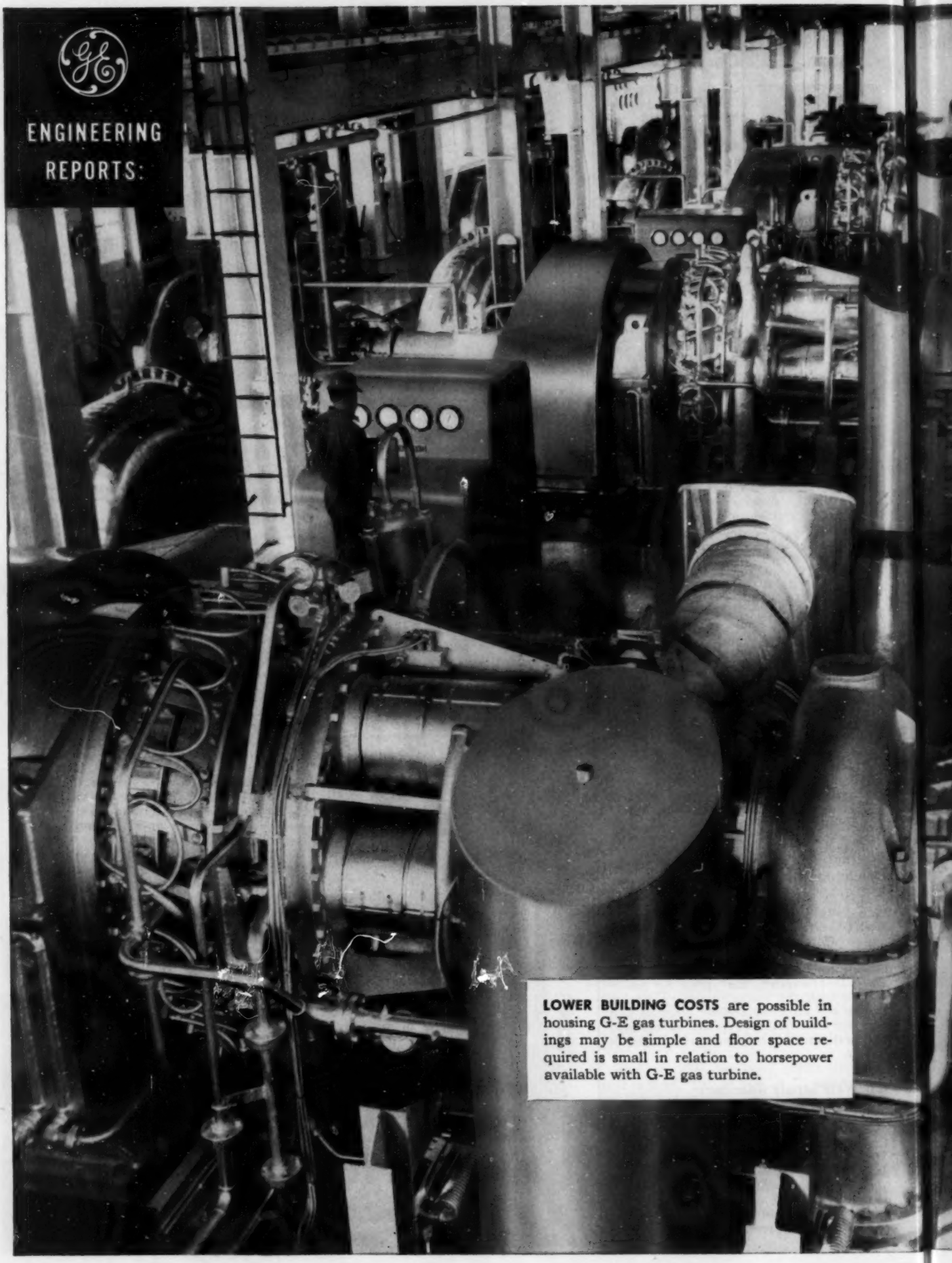
For more data on advertised products, use Readers' Service Cards, last page.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41 G-E GAS TURBINES now operating in gas pipeline industry have proved to be economical power sources.

8 G-E gas turbines for Northern Natural Gas give up to

25% MORE HP FOR PEAK LOADS

A total of eight 5700-hp General Electric gas turbines are now in operation at the Tescott and Macksville compressor stations of Northern Natural Gas Company in Kansas.

These complete, economical prime movers have this fundamental characteristic: horsepower increases as ambient temperature decreases. Thus, during cold weather, when demand is greatest, up to 25% more power may be delivered.

Proven economies of operation and maintenance explain why many natural gas pipeline stations are being planned for G-E gas turbines. Have you investigated their many advantages?

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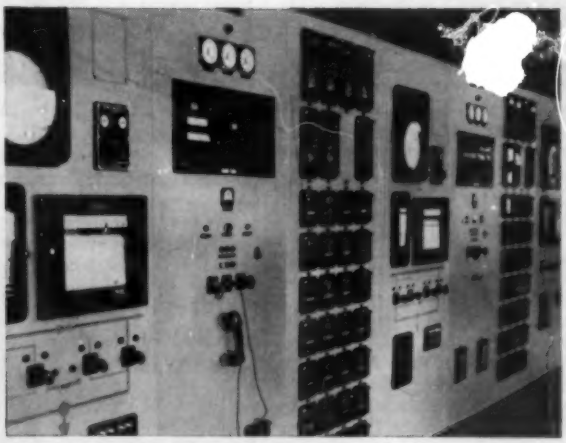
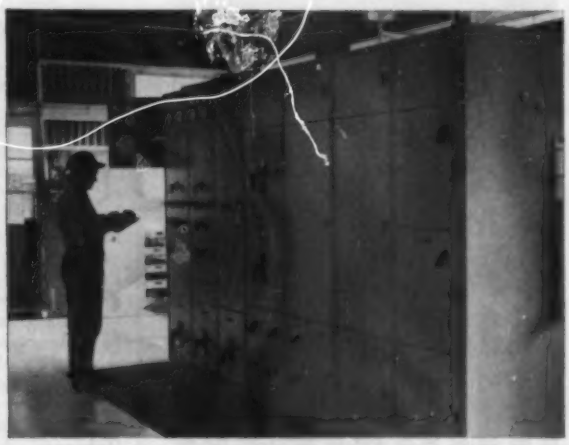
GENERAL ELECTRIC



COMPLETE STATION CONTROL is handled from the four combined process-control and turbine-control panels. After preliminary manual operations, turbine comes to speed automatically.



COMPACT, FACTORY-ASSEMBLED, low-voltage switchgear, Cabinetrol® panel at Tescott station were planned by General Electric to take a minimum of space and to meet the station's individual requirements.

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Everything you need . . . for field instrument calibration

MERIAM Manometer Kits

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★ All stainless steel construction

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Ralph T. Enloe

George Gower

George Basquez

C. W. Harrison

Louis Gosden

R. V. Atkinson

George M. Cowie

Emsco Manufacturing Expands Machinery Sales Department

Emsco Manufacturing Company has announced an expansion of its Machinery Sales department, which incudes the addition of seven sales engineers who will augment the Continental Suppy Company's Machinery Sales department.

Morris A. Simmons has been appointed assistant manager, Machinery Sales, with headquarters in Dallas. Reporting to T. S. Ramey, Mid-Continent division machinery sales manager, he has been with Emsco 20 years in various machinery sales capacities. The seven sales engineers will report to Simmons.

Ralph T. Enloe, with Emsco since 1947, will be sales engineer for machinery sales in the Ark-La-Tex Mississippi area with headquarters in Shreveport. Before his promotion, he was in charge of the same area as division manager for the D+B division of Emsco. Charles W. Harrison wiii be in charge of the Oklahoma, Indiana, Kentucky, Kansas and Illinois area with headquarters in Tulsa. He formerly was with Parkersburg Rig and Reel Company as sales engineer.

Louis Gosden, transferred from Emsco's Machinery sales department in California, will be in charge of the Rocky Mountain area with headquarters in Denver. He formerly was with Wilson Manufacturing Company and National Supply Company. Robert V. Atkinson, who will be in charge of the West Texas and New Mexico area with headquarters in Midland, Texas, has been with Emsco since 1950.

George M. Cowie, with Emsco since 1928, has been appointed sales engineer to handle Canadian operations and will have headquarters in Edmonton. George Gower will be in charge of the Louisiana coast and offshore operations with headquarters in New Orleans. He has been with the company since 1950 as service engineer. George Basquez, sales engineer for the Texas Gulf Coast area with headquarters in Houston, previously has served as service engineer, machinery salesman and, most recently, as advertising manager.

See Composite and Refinery Catalogs, or Write for Specifications Folder

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Nozzle sizes from ¼" to 24"

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Special sizes and lengths. Schedules 10 to 160 Stainless Steel, and other Alloys.

Nominal pipe sizes 1" to 30"

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FLEET-LINE CO.

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SHREVEPORT, LOUISIANA

Fischer & Porter Names Rich Petroleum Industry Coordinator

Frederick S. Rich, formerly senior instrument engineer for Arabian American Oil Company, has been appointed petroleum industry coordinator for Fischer & Porter Company.

F. S. Rich

Rich has 22 years experience in instrumentation, 20 of which have been in the petroleum industry. Before joining Arabian American Oil, he was senior instrument engineer for Arthur G. McKee & Company. Previously he was with Carbide & Chemical Company at Oak Ridge and with Standard Oil of New Jersey at Aruba, N.W.I.

Atlas Powder Sales Agent Retires After 37 Years

A. H. Cunningham, sales agent for Atlas Powder Company at Los Angeles since 1943 and a member of the Los Angeles explosives sales force since 1918, has retired.

Cunningham joined Atlas in 1915 and was assigned to the San Francisco sales district in 1918. He became sales agent in 1943.

Hamer Valves Appoints French Representative

Hamer Valves, Inc., Long Beach, Calif., and Joshua Hindle & Sons, Ltd., of Leeds, England, licensed manufacturer of Hamer valves, jointly announce the appointment of Societe d'Etudes Petrolieres as exclusive selling agent for Hamer products in France and French possessions. Societe d'Etudes Petrolieres will also assist with representation and sale of Hamer products in Spain, Italy, Holland, Switzerland, Belgium, Luxemburg, Western Germany, Yugoslavia, Norway and Sweden.

Arrangements for the representation were completed with Roger Henquet, general manager of Societe d'Etudes Petrolieres, and W. Gomersall, managing director of Joshua Hindle & Sons, Ltd., by Maurice E. Holladay, vice president of Hamer Valves, Inc., during a recent trip to Europe.

Founded in 1952, Societe d'Etudes Petrolieres currently acts as consultant to various European oil companies in the field of petroleum exploration and production. They also represent a number of major American companies manufacturing equipment for the petroleum industry. G. Cance, Ingenieur A. M., technical director, and C. G. Magne, Ingenieur E. C. P., will be in charge of the new department formed to handle the Hamer and Hindle-Hamer products.

Houser Elected Treasurer Of H. K. Porter Company

Robert C. Houser has been elected treasurer of H. K. Porter Company, Inc. Houser succeeds James C. Leslie, who resigned to become president of Holgate Company, Kane, Penn.

Rocco J. DiFonso has been named assistant treasurer and Edward R. Moran has been named assistant secretary.

Large Gas Carburizing Furnace Installed at Pittsburgh Gear

New heat-treating equipment, including what is believed to be the largest radiant tube pit-type gas carburizing furnace ever built, has been installed in the Pittsburgh plant of the Pittsburgh Gear Company, subsidiary of Brad Foote Gear Works. Designed to provide the most advanced techniques in deep case carburizing and hardening in controlled atmosphere, the new equipment will allow increased production of the company's armored gear products. It also will widen the range of armored gears available, including new sizes up to over six feet in diameter.

In addition to the carburizing and hardening furnace, new equipment includes a double propellor agitated 6000-gallon direct cooled quench tank and an 8000 reserve storage provided with heat exchangers and coolers to maintain and control oil quench temperatures. Also a dual-heat 1400° F. draw furnace has been added. The system will handle parts up to six feet in diameter, six feet long, and up to 8500 pounds in weight. It was designed to produce up to 25 tons of deep case carburizing per month.

Got a Hard-to-Handle Job?

Trust it to a BRADEN Winch

Where sureness and safety is extra important in handling heavy equipment, trust the job to a BRADEN Winch. Every BRADEN Winch is easy to control, and its PATENTED, OIL COOLED, FULLY ADJUSTABLE AUTOMATIC SAFETY BRAKE can be depended upon to hold the load during moving operations.

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BRADEN Winches

"IN SERVICE AROUND THE WORLD"

International Harvester Announces Truck Field Sales Staff Changes

Three transfers and a promotion among International truck field sales executives in the Midwest and East were announced by the motor truck division of International Harvester Company following retirement of C. A. Samuelson as St. Louis district manager.

Barr Crawford, district manager at Pittsburgh, moved to St. Louis in the same capacity. A 21-year International Harvester veteran, Crawford also served in various sales capacities at Los Angeles and Kansas City, Mo. H. A. Herman, district manager at Fort Wayne, Ind., was transferred to Pittsburgh as district manager. Herman's sales career with the company started in Pittsburgh in 1932.

M. J. Gowen, district manager at Richmond, Va., moved to the same position at Fort Wayne. Gowen, who has served with International truck sales since 1928, had previous assignments at Philadelphia, Baltimore, and Cincinnati. R. W. Maxwell, assistant district manager at Richmond, was promoted to district manager at that post. His International truck sales experience includes service at the Philadelphia district.

Samuelson retired from the St. Louis post after service with the company since 1912. He joined the company at Minneapolis and gained sales experience in both retail and wholesale operations. He was named district manager there in 1944 and was transferred in the same capacity to St. Louis the same year.

Washington Office Manager Named by Enterprise Engines

The appointment of Rear Admiral John G. Johns, U.S.N. (Ret.), as manager of the Washington, D. C. engineering office of the Enterprise Engine and Machinery Company, manufacturer of diesel engines, has been announced.

John G. Johns

Johns is a graduate of the U. S. Naval Academy and served in all ranks during 34 years active service. He spent 19 years as a submariner, acquiring an extensive knowledge of many types of diesel engines.

New Spudder Distributor Named by Bucyrus-Erie

Cable Tool Supply Company has been appointed a distributor for spudders in portions of four states by Bucyrus-Erie Company. Serving parts of Illinois, Indiana, Kentucky and Tennessee, the new distributor will sell and service Bucyrus-Erie's complete line of spudders, and ample parts stock will be carried at their shop just east of Princeton, Ind.

Henry C. Neely, for many years a Bucyrus-Erie district drill sales representative in Evansville, Ind., will be assisted by William J. Wheeler.

Walworth Company Acquires Alloy Steel Products Company

Acquisition by Walworth Company of the assets and business of Alloy Steel Products Company, Inc., manufacturers of stainless steel and other corrosion resistant alloy valves marketed under the name Aloyco, has been announced.

Alloy Steel, which has district offices in eight major cities throughout the U. S., will be operated as an independent subsidiary of Walworth Company, retaining present management and employes and continuing present policy.

Kaiser Steel to Purchase Cushenbury Limestone Deposit

Kaiser Steel Corporation is exercising its option for the immediate purchase of a vast, undeveloped limestone deposit in Southern California, the purchase price to be in excess of $1 million.

The ten-square-mile area of mining claims, known as the Cushenbury deposit, is in San Bernardino County, 75 miles from the Kaiser steel plant in Fontana. Testing and exploratory work indicates the deposit contains enough high-grade metallurgical limestone to meet Kaiser Steel's requirements for decades.

Clark Announces Appointment Of New Tulsa District Manager

The appointment of Charles J. Michelson as district manager of the Clark Tulsa offices has been announced by Clark Bros. Co., one of the Dresser Industries. Prior to joining Clark, Michelson accumulated 11 years of heavy oil field machinery experience.

Announcing the improved
TYPE "Z"
WmSEAL CASING
BUSHING
STAINLESS STEEL CLAMPS ARE HAND TIGHTENED, NO TOOLS REQUIRED
SOLID RING OF TOUGH SYNTHETIC RUBBER — NO JOINT
TIGHTER SEAL WITH WIDE STAINLESS STEEL BANDS AND CLAMPS
"Z" BUSHINGS STAY PUT EVEN IF PIPE MOVES IN CASING
COMPLETE CORROSION RESISTANCE
NO SHIELD REQUIRED
WmSEAL "Z" BUSHINGS ARE AVAILABLE FOR 4" SIZE AND LARGER PIPE
NON-SKID TEETH ON EXTRA LONG SKIRT HOLD BUSHING FAST TO CASING
EXTRA THICK "SHOULDER" (TOUGH SYNTHETIC RUBBER) CANNOT CUT THROUGH EDGE OF CASING

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REPRESENTATIVES: Houston • Pittsburgh • Plainfield, N. J. • Amarillo • Casper • Provo, Utah • Joliet, Illinois • Los Angeles • San Francisco • Bartlesville, Okla. • Edmonton • London, Ontario • Calgary • Buenos Aires • Durban, Natal, South Africa

Beaver Pipe Tools Appoints Vaught District Manager

W. H. Vaught, Sr.

Beaver Pipe Tools, Inc., has announced the appointment of William H. Vaught, Sr., as district manager for the Beaver firm. His territory will include Kentucky, West Virginia, southern Ohio and southern Indiana.

Vaught, who attended the University of Kentucky, is a mechanical engineer. Before joining Beaver, he was formerly associated with a large Chicago tool manufacturer as territory sales representative. Vaught's office and residence are in Cincinnati, Ohio.

East, Midwest District Managers Appointed by Graver Construction

Graver Construction Company, Inc., announces the appointment of two district construction managers. For the Midwest area, Martin H. Swanson has taken charge of the district office and equipment yard maintained at Joliet, Ill. In the East, Frank D. Ahern heads the new district construction base at Edge Moor, Del. These facilities and similar centers in Houston and Casper, Wyo., serve as operating bases for company construction personnel, tools and equipment.

Bushnell Added to Sales Staff Of Tube Turns Plastics, Inc.

Theron S. (Ted) Bushnell, appointed Midwest district manager of Tube Turns Plastics, Inc., formerly was with the DoALL Company handling extensive sales-engineering assignments in a variety of industrial fields.

Bushnell will make his new headquarters in Chicago. His territory includes Illinois, Indiana, Iowa, Minnesota, Wisconsin, Michigan, Ohio, West Virginia and Missouri. He also will service customers in Pittsburgh.

Tube-Kote Sales Territory Expanded in Oklahoma-Kansas

Bill Ramey has been appointed Tube-Kote, Inc. sales engineer for Oklahoma and Kansas and will make his headquarters in Tulsa.

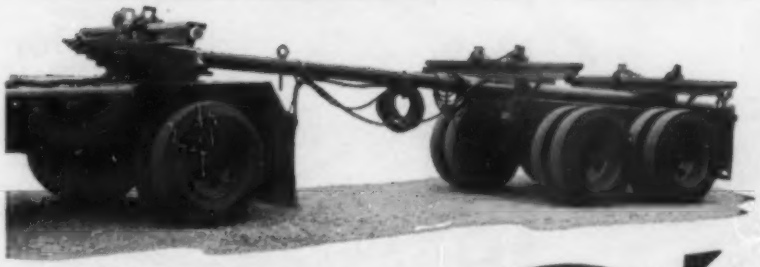
For the past three years Ramey was associated with Western Geophysical Company of America as party manager for offshore exploration crews in Texas and Louisiana. He will be responsible for introducing in Oklahoma and Kansas the complete Tube-Kote line of services for protecting oil field and refinery tubular goods from corrosion damage and paraffin deposition.

Roger Bartelsmeyer Joins Staff of Atlas Pipe Inc.

Roger E. Bartelsmeyer has joined Atlas Pipe Inc. as sales representative in Corpus Christi, Texas.

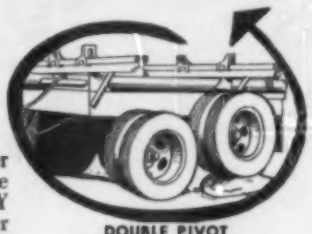
A graduate of Rice Institute, Bartelsmeyer has been employed by the National Tube Division of the United States Steel Corporation for the past five years.

TOP QUALITY PIPELINE TRAILER



THE LOADCRAFT

PIPELINER



DOUBLE PIVOT TANDEM PRINCIPLE

At last here's a top-quality tandem trailer for the pipeline industry that is really built to take the cross-country hikes. The axles will STAY in alignment. Quality that has made Spencer Trailers popular with the oil fraternity for over 38 years goes into each of these jobs.

Double pivot tandem keeps load in balance in rough terrain, reduces wear and tear on axles and tires Hi-tensile pressed steel frame, wood surface block-type bolster plus other exclusive features gives you the kind of trailer you have needed . . and at a price that is less than you would expect to pay for such high quality.

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Please send me information on your
Pipeliner___ Pole Trailer___ Oil Field Float___
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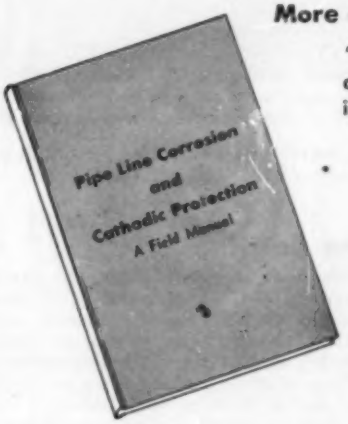
TOWN_____STATE_____

More comments on this new Handbook:

"... a most practical on-the-job manual for men concerned with pipe line corrosion. We are ordering copies for each of our district engineers."



Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This Handbook, written by Marshall E. Parker, consultant, is designed as a practical field manual. It is a 108-page pocket-size volume printed first as a popular series in WORLD OIL. The Handbook is illustrated with many charts and drawings and is completely indexed by subjects.

It presents comprehensive data on Soil Resistivity Surveys, Potential Surveys, Line Currents, Current Requirements, Rectifier Systems, Ground Bed Design, Magnesium Anodes, Stray Current Electrolysis, Interference in Protective Systems, Operations and Maintenance, and Coating Protection and Testing.

An appendix has been added of technical data on Underground Corrosion, Basic Principles of Cathodic Protection, Properties of Metals and Attenuation Equations. Order copies of this practical Field Manual now for each of your field men. Price $3.

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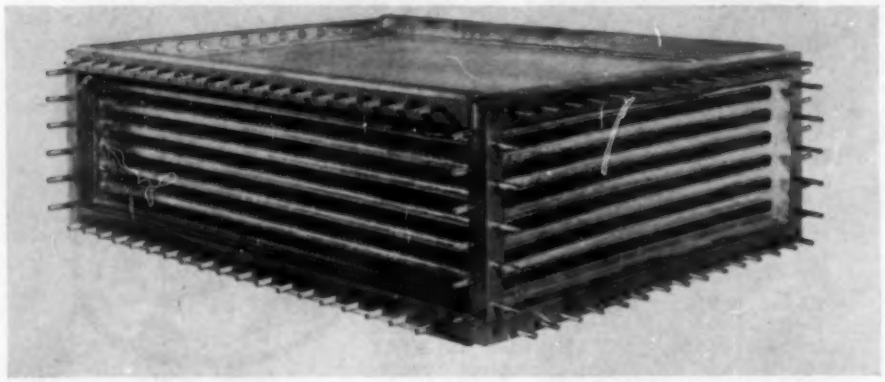
for the Pipe Line Industry

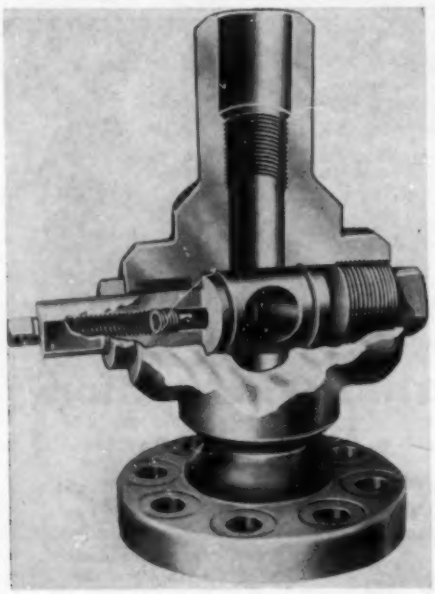


Heat Exchanger

A heat exchanger with a finned plate design developed for recovery of heat from high temperature waste gases has been released by The Griscom-Russell Company. It is designed to withstand gases at pressures up to 100 psi and temperatures up to 1100° F.

The exchanger is of compact cross-flow design, with extended surface consisting of corrugations on both shell and tube sides. An individual cell consists essentially of three parts, the corrugated sheets, formed and butt-welded flat tubes, and the blanked and extruded sheet metal tube sheets. All sealing surfaces are heliarc welded to insure tightness, and all surfaces are covered with a protective nickel-base brazing alloy which also joins the corrugated sheets to the tubes. This alloy and its application technique have been developed to resist high temperature oxidation and corrosion from hot combustion products, sea water and many acids and other chemicals.

For more data circle **No. E1** on Readers' Service Card, last page this issue.



Hot-Tap Valve

Oil Well Supply Division of United States Steel Corporation announces production of the Handy hot-tap valve, specifically designed for use in tapping gas transmission lines under pressure.

Body of the valve is machined from a solid one-piece forging, leaving no bonnets to leak or bonnet bolts to corrode. The stuffing box is fully enclosed as part of the body. Plastic packing is inserted through a removable set screw in the side of the valve. Designed in accordance with A.S.A. Series 600 Standard, it also can be used as a blow-down valve on drips or low places in the line.

(This item supplements United States Steel Corporation, Oil Well Supply Division, data on Pages 3809-3960 and 5297-5304 of Composite Catalog, 21st Edition.)

For more data circle **No. E2** on Readers' Service Card, last page this issue.

Line Locator

Advanced automation methods now employed in the manufacture of Wilkinson Products Company's line locator, etches receiver circuitry on to rugged phenolic material, resulting in a dependability and uniformity of instrument function not possible under previous hand assembly methods. Better over-all quality control is maintained, and less variation between sets permits an interchange of transmitters and receivers for operators using multiple locating equipment.

Use of phenolic material in fabrication of the instrument cases increases their resistance to wear. This material has a tensile strength of 7000 pounds per square inch. Compressive strength, flatwise, is 25,000 pounds per square inch; maximum moisture absorption is 1 percent. Carrying weight of the new line locator is under ten pounds.

Subsurface installations with ice or frozen ground cover offers no problem to the improved locators.

For more data circle **No. E3** on Readers' Service Card, last page this issue.

Spark Resistant Tools

Ingersoll-Rand announces a new line of paving breaker, demolition and digging tools for use in plants handling hazardous liquids or flammable gases or dusts which could be spark-ignited. The tools are forged from a beryllium copper alloy, a material known for its spark resisting properties and used for years in cast tools for safety purposes. Greater life than that of their cast counterparts is claimed for the new spark resistant tools.

(This item supplements Ingersoll-Rand Company data on Pages 2597-2604 of the Composite Catalog, 21st Edition.)

For more data circle **No. E4** on Readers' Service Card, last page this issue.

Industrial Tractor

A new rubber-tired 42-horsepower wheel tractor, the International 300 Utility model, designed for industrial fields, has been announced by International Harvester Company.

Powered by a gasoline engine, the tractor weighs 3820 pounds, 1000 pounds more than tractors of comparable size and class. The added weight was designed to provide greater traction, stronger power train and axles.

The Model 300 is available either in standard 5-speed transmission or torque amplifier drive. The torque amplifier gives 10-speeds forward from 1.5 to 16.7 miles per hour and provides speed and power changes up to 45 percent on the go without operator touching throttle, clutch, or shifting gear.

Specifications include 75-inch wheelbase, 118-inch over-all length, 59½-inch over-all width, and a 9-foot, 8-inch turning radius. Over 22 attachments are available as optional equipment for the tractor.

(This item supplements International Harvester Company data on Pages 2605-2608 of the Composite Catalog, 21st Edition.)

For more data circle **No. E5** on Readers' Service Card, last page this issue.

Blacktop Coating

The Meco "Black Knight" surface sealer described in the New Equipment section of the November issue of PIPE LINE INDUSTRY is manufactured by Maintenance Engineering Company, 16 West Johnson Street, Philadelphia 44, Penn. Reference to the Maintenance Engineering Corporation's listing on pages 2997-3000 of the Composite Catalog, 20th Edition, is incorrect for this product.

Save time! Keep informed! Circle numbers on Readers' Service Cards, last page this issue.

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He is a Bell System communications engineer. His purpose is to help you speed your operations, cut your costs and improve your service—by making sure your communications meet your exact requirements.

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Sealol Flexibox Type RR Seal.

Complete automation at unattended pumping stations demands absolute efficiency from rotary pump shaft seals. This is where Sealol-Flexibox Mechanical Shaft Seals pay off. These seals operate for long periods of time without adjustment or service of any kind. Sealol means the difference between leak-proof pump performance and irritating, expensive maintenance trips to unattended stations.

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Flexibox GMBH, Frankfurt

SEALOL

THE BALANCED PRESSURE SEAL

NEW EQUIPMENT . . .

Crawler Tractor

Introduction of a 90-horsepower crawler type tractor is announced by Hanomag of Hannover. Identified as the K90E, this new tractor is available with factory mounted angledozer as illustrated or with standard bulldozer or overhead loader equipment.

For more data circle **No. E6** on Readers' Service Card, last page this issue.

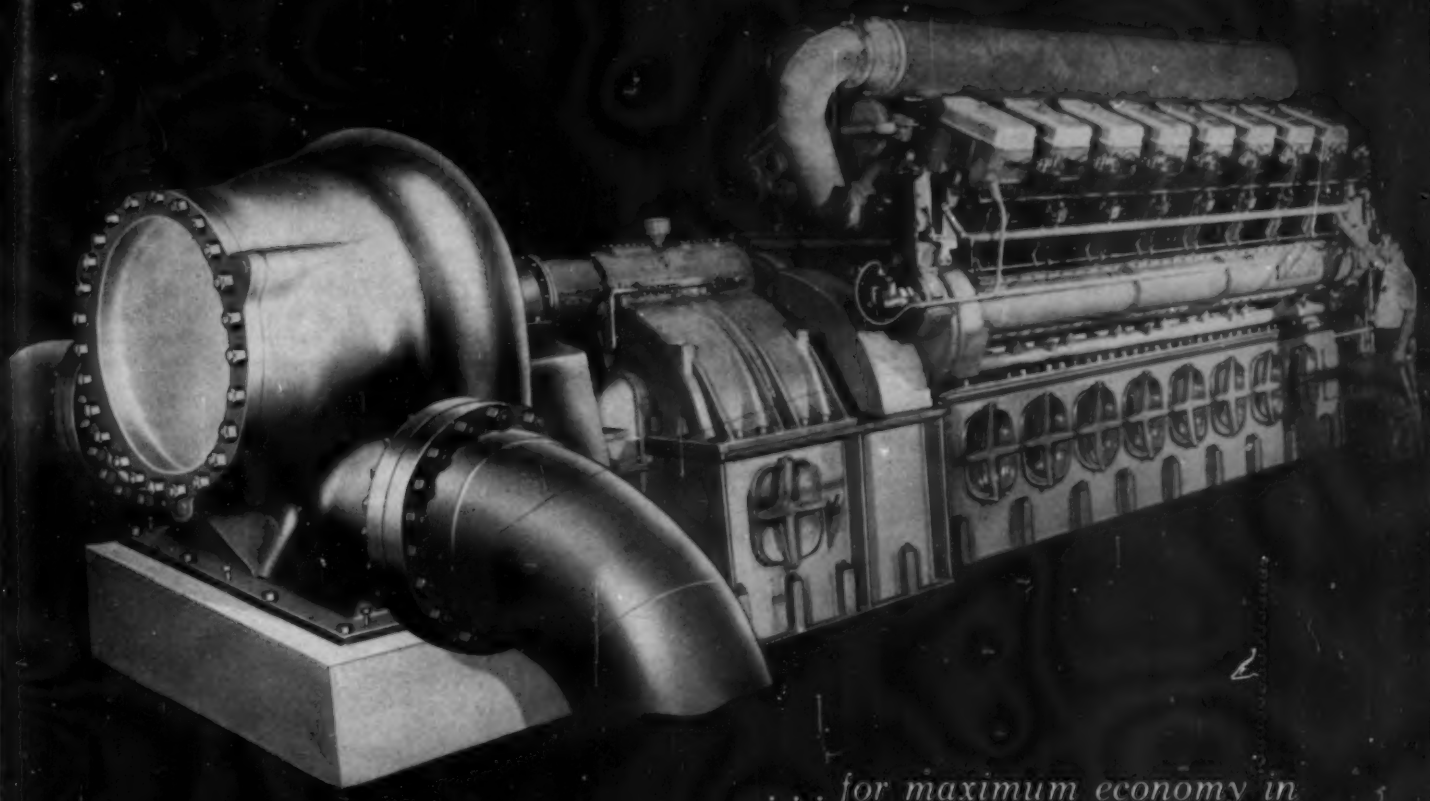
Safety Handle

Ingersoll-Rand Company has announced development of a safety handle designed especially for use on demolition tools to prevent operators from injuring their hands when working close to walls or projecting masonry.

Weighing less than two pounds, the safety handle is available on the new Ingersoll-Rand paving breaker. It also can be purchased separately for attaching to previous models.

(This item supplements Ingersoll-Rand Company data on Pages 2597-2604 of the Composite Catalog, 21st Edition.)

For more data circle **No. E7** on Readers' Service Card, last page this issue.



. . . for maximum economy in Gas Pipe Line service . . .

THE NORDBERG *SUPAIRTHERMAL*®

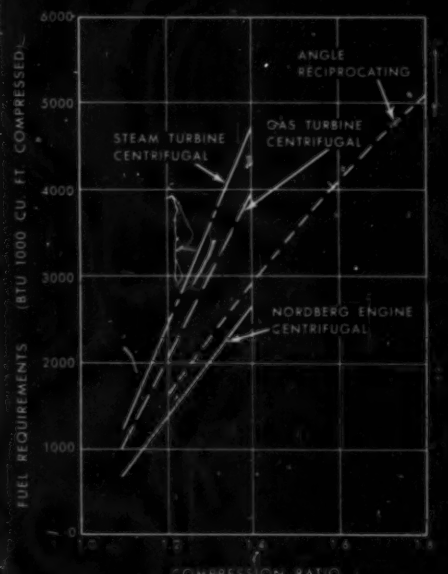
ENGINE-DRIVEN CENTRIFUGAL COMPRESSOR UNIT

Here is the latest development in compact, dependable power for maximum efficiency and economy in gas pipe line transmission service . . . *The Nordberg Supairthermal Engine-Driven Centrifugal Compressor Unit.*

Through use of exclusive design principles, the Nordberg *Supairthermal* spark-ignition gas engine operates at better than 40% thermal efficiency — with correspondingly lower fuel cost, increased horsepower, lower lube oil consumption, and lower maintenance costs per horsepower hour. The *Supairthermal* engine drives the compressor through a close-coupled speed increasing gear mounted on the bedplate extension of the engine.

Here, then, is an extremely compact, efficient engine-driven compressor unit which can be installed at low capital investment and operated at lower cost per horsepower than any other type of gas pipe line prime mover.

NORDBERG MFG. CO., Milwaukee, Wisconsin



Savings of thousands of dollars per day in fuel costs on large gas pipe lines can be realized with the Nordberg engine-driven centrifugal gas compressor unit because this unit requires less fuel to compress gas than any other modern type of equipment of comparable capacity.

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your plug valves
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PLUG VALVE
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NOW they can be—automatically—by the adaption of this simple, fool-proof device, that never forgets.

Each time the valve is opened and closed a measured amount of lubricant is forced in. The reservoir holds enough lubricant for the valve to be opened 50 to 80 times, and is refilled in seconds with the Delta Gun.

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PLUG VALVE LUBRICANTS AND EQUIPMENT

LUBRICANTS FITTINGS GUNS LUBRICATORS

NEW EQUIPMENT . . .

Earth Boring Tool

An addition to its line of wet-hole, horizontal earth boring tools has been announced by Hydrauger Corporation. This newest Hydrauger has been constructed for swift installation of three-quarter-inch service connections where the piping extends beneath paved or non-trenchable areas.

The sled model can run-in a fully assembled, 45-foot string of wrapped pipe in one uninterrupted operation in soils which form a slippery mud or mixing with the 2 gpm of water which flows through the boring bit. In rocky formations, the machine uses standard boring-bar sections and 2-inch pilot-bit which produces an open hole through which the wrapped service pipe is then inserted.

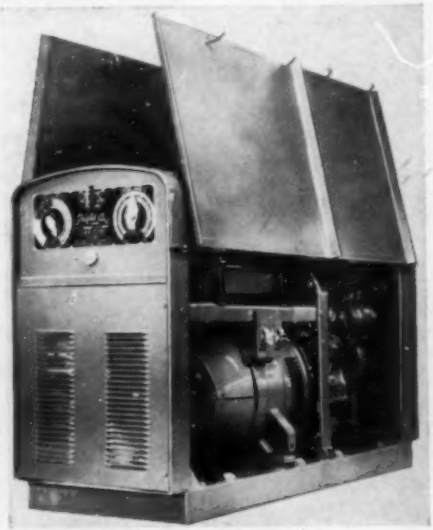
The entire machine sets within a 12-inch trench and its forward motion is gained by the operator using a foot pedal which operates a cable reel. For boring, the air motor of the 80-pound machine develops over 3 horsepower on 85 psi air supply.

For more data circle **No. E8** on Readers' Service Card, last page this issue.

Diesel Driven Welder

A new diesel-powered welder for construction, pipe line and structural welding has been announced by The Lincoln Electric Company. Rated 250 amperes at 40 volts, 60 percent continuous duty cycle, it features diesel-powered welding capacity in a relatively compact, low cost design. It is shorter and weighs 20 percent less than a comparable 300 ampere welder.

The arc can be controlled as to type as well as intensity to permit efficient welding in all positions and under varying conditions of field welding. It has a range of 50 to 250 amperes, handling electrodes



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GOTKOOL Water Cooler — made in 2, 3, 5, 8, 10, 15, and 20-gallon sizes with extended or recessed flush-mounted faucet optional. *(Note: 15- and 20-gallon sizes available with extended faucet only.)*

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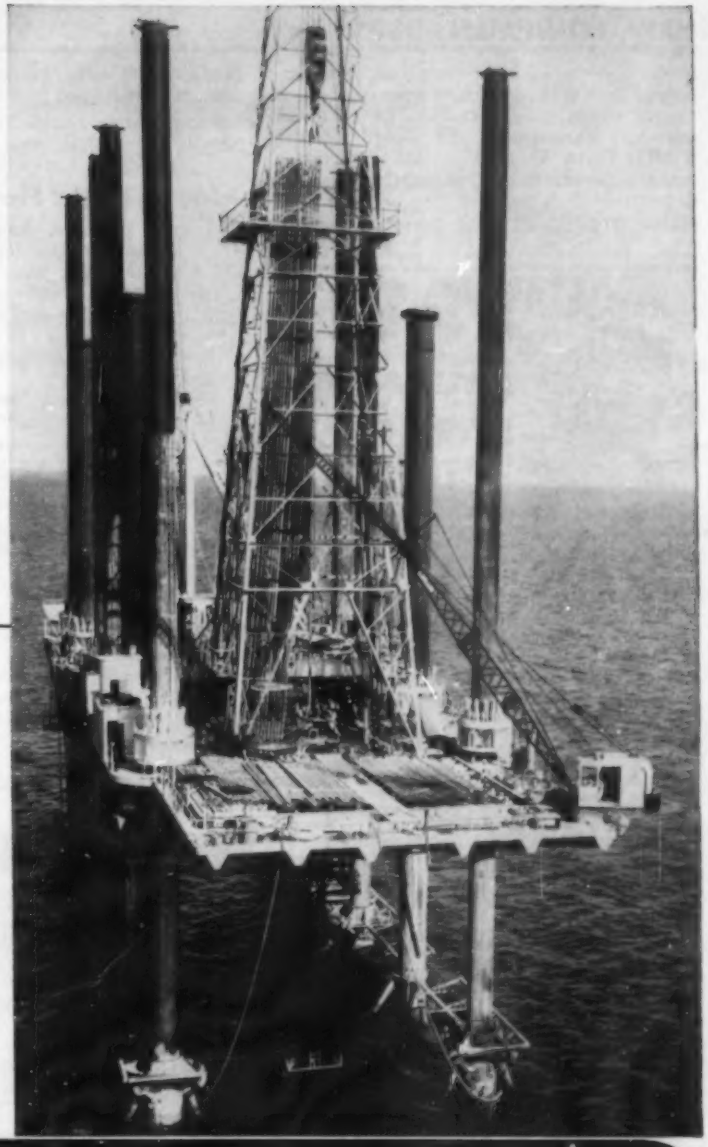
KEEP PURE DRINKING WATER ALWAYS HANDY

LORAINS "GO TO SEA" ON OFFSHORE OPERATIONS

Drillers and pipeliners are going to sea more and more. And wherever they go, Lorains go with them, just as they go with drillers and pipeliners on land. The same dependable features and advantages that make Lorains so popular with oil field men, are the reasons they are chosen for these sea-going assignments. Here are two different offshore operations . . . and Lorains are on deck for both of them.



G. B. GLASSCOCK DRILLING CO.

Corpus Christi, Texas

"MR. GUS" is the largest self-contained mobile offshore drilling unit. It is equipped with two pier-mounted Lorains—a 6-ton "TL-10" and a 22½-ton "424." The "424" is shown in this picture. "Mr. Gus" cost a total of $3½-million, is as tall as a 7-story building and can drill in water up to 100 ft. deep. Both Lorains handle pipe and supplies and transfer personnel from crew boats to barge platform. The "424" is used in erection of production platforms and installs piling, too.

SAM CARLINE, INC., *Berwick, La.*

Another offshore job, and this time it's laying 10" concrete coated pipe submerged in the Gulf of Mexico, for Marine Gathering Co. of Houston, Texas. The submerged lines gather oil from offshore wells. Here, two more Lorains selected by Sam Carline, Inc., who specializes in laying submerged pipe, are "on deck." The two Lorain-50 Cranes operate from a 200 ft. long plank roadway along the entire length of this special lay barge and are used to handle pipe sections prior to welding and to feed the welded and coated pipe into the water.

Complete selection in the Lorain line makes it possible for oil men to better fit their needs—on land or offshore, in the field, on the pipelines, or in the refineries—with Lorains. Ask your Thew-Lorain Distributor for facts on the many sizes, types and mountings for lowest cost performance.

THE THEW SHOVEL CO., LORAIN, OHIO

THEW LORAIN®

For more data on advertised products, use Readers' Service Cards, last page.

from 1/16 to 1/4-inch diameter. An improved fuel system of the engine maintains accurate current output both in arc striking and throughout the range of the welder. From no load to full rated load, speed variation of the engine is regulated to less than 3½ percent. The welding generator is equipped with power outlets to provide 115 volts, d-c auxiliary power for operating tools and lights.

For more data circle **No. E9** on Readers' Service Card, last page this issue.

Atomic Weld Flaw Detector

A new portable, 75-pound weld flaw detector, recently developed by the M. W. Kellogg Company, utilizes iridium 192 at an intensity of 1600 millicuries, and is useful particularly for inspection of pipe line welds and repairs in places inaccessible to conventional X-ray methods and techniques.

The new detector has a ¼-inch cast stainless steel case and a removable cast aluminum handle. Cone of radiation is about 120 degrees. A cast lead shield with a minimum thickness of 2⅝ inches protects the operator. The instrument is 9⅝ inches high with the handle on and 7¼ inches with the handle off; maximum width is eight inches.

For pipe line work, one shot is sufficient for small diameter pipe; two shots for 6 to 8-inch diameter; and three shots of 120 degrees each, for larger diameters. With efficient handling of fixtures and film, it should be possible to inspect from 18 to 54 welds per day, depending on pipe size.

For more data circle **No. E10** on Readers' Service Card, last page this issue.

Combination Relief Valve

Fluid Mechanics Company has designed a valve for low pressure tanks needing both pressure and vacuum relief. It is, in effect, two separate valves mounted in one valve body.

On the vacuum side, the valve can be set to open on as little as one inch of water differential. It can be set to exhaust at ½ pound psi to 150 pounds psi.

On the pressure side, the valve can be modified to relieve in overpressure or to relieve in blowdown control. In the latter case, pressure inside the tank must fall a set amount below relief pressure before the valve will reseat.

The combination valve is constructed of high grade cast iron with bronze inner valve parts. The springs which load the two seats are stainless steel and are adjustable over a wide range of pressures. Both sets of seats are microlapped to insure proper seals.

The lift lever operates the pressure seat only. The valve is shrouded with copper screen to protect the working parts from insect damage.

For more data circle **No. E11** on Readers' Service Card, last page this issue.

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PARAFFIN
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Our Sales Engineers are available in all parts of the oil country to show what BRAKESOL will do for your particular Paraffin problem. We do not ask anyone to buy until they have been shown. Just contact your nearest Supply Store to arrange for a FREE field test.

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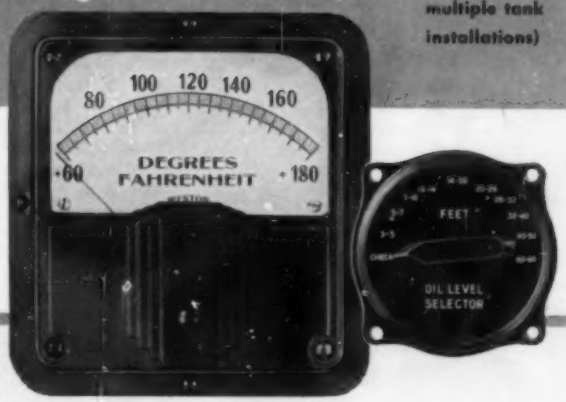
AVERAGE TANK TEMPERATURES INSTANTLY

(single or multiple tank installations)



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Time saving...Money saving! You simply turn the selector switch to the oil depth, press the button, and directly read the *average* temperature of the oil in the tank. Time: *about one second flat!* Instruments can be mounted at base of tank, or at remote control points. For multiple tank installations special tank selector panels are supplied. For the complete story, write for bulletin... Weston Electrical Instrument Corporation, 614 Frelinghuysen Ave., Newark 5, N. J.—*a Subsidiary of Daystrom, Incorporated.*

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Linked to liquid level by infallible magnetic force, Magnetrol is free from the limitations inherent in mechanical or electrical controls. With the actuating magnet rated at 98% of initial strength after 30 years, Magnetrol has *infinite operating life,* with practically no maintenance at all. There are no wearing parts to get out of order.

What's more, Magnetrol's simple operating principle permits easy, economical modification of standard units to meet *any* pressure, temperature or corrosion requirements. That's why there's practically no limit to Magnetrol's use. It's also why "specials" are likely to be standard with us. Magnetrol units control level changes from .0025-in. to 150-ft. —with single or multi-stage switching.

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QUALITY and SERVICE

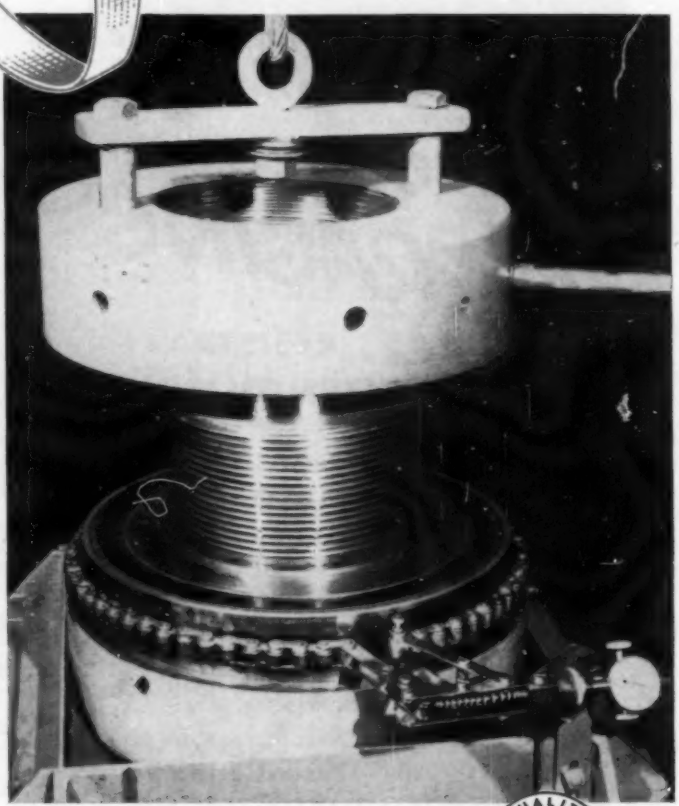
with this ring . . . I thee wed

OF COURSE the parties involved had been going around together for some time—in fact, ever since they met in the Open Hearth—but it took the "ring test" to finally prove their mettle.

A perfect union of chemical components carefully controlled to make a steel of the required outstanding physical properties necessary to produce Line Pipe worthy of the name "YOUNGSTOWN".

The "ring test", pictured at the right, is the last of many rigorous tests used to prove the quality of Youngstown Electric Weld Line Pipe. A three inch section, or ring, of finished pipe is telescoped over the rubber gasket of the testing machine, and hydraulic pressure applied to determine the TRUE yield strength.

A TRUE test result due to the fact that the physical properties of the specimen ring have not been changed by cold working to flatten. Furthermore, the ring test closely simulates service conditions of installed pipe lines. Yes, final proof of outstanding quality and extended service.



QUALITY YOUNGSTOWN SERVICE

Youngstown ELECTRIC WELD LINE PIPE

THE YOUNGSTOWN SHEET AND TUBE COMPANY Manufacturers of Carbon, Alloy and Yoloy Steel

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New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers Index. Simply circle code numbers of items desired—sign and mail card.

Gamma Ray Projector

A portable gamma ray projector with advantages of economy and operation over conventional X-ray equipment used in industrial radiography is the subject of a new booklet now available from Metal & Thermit Corporation. The booklet introduces its subject with a discussion of radioactive materials, isotopes, kinds of radiation and "hard" and "soft" rays.

It offers a simple explanation of the three gamma ray sources used with the radiographic device and details operation and construction features of three models presently available: the 75-pound model for pipe and field work; the 250-pound model, designed for use on pressure vessels, tanks and large pipe, which can be adjusted to emit radiation in doughnut, hemisphere or cone patterns; and the larger, 2950-pound model, designed for larger vessels and non-destructive testing. It can be adjusted for spot or panoramic shots. Also included in the booklet is a gamma ray intensity and film exposure guide which permits a radiographer to locate and schedule work so as to minimize disruption of other work and predict any unsafe working areas.

To get a copy circle **No. E12** on Readers' Service Card, last page this issue.

Hydrocrane Bulletin

A new bulletin describing Bucyrus-Erie's new all-hydraulic, truck-mounted hydrocrane has been released by the company. The bulletin is supplemented by a separate 4-page specification list, packaged in a compact folder.

Illustrated with on-the-job photographs, the booklet describes new features of the hydrocrane, such as travel speeds, design, lifting capacity, construction, controls and accessories.

To get a copy circle **No. E13** on Readers' Service Card, last page this issue.

Turbodiesels

Answers to many questions on turbocharging can be found in Cummins Engine Company's latest booklet. Also included are illustrations and complete descriptions of the company's five turbodiesels, the 175-horsepower JT-6; the 250-hp NT-6; the 262-hp NTO-6; the 300-hp NRT-6; and the 60-hp VT-12.

To get a copy circle **No. E14** on Readers' Service Card, last page this issue.

Pipe, Couplings Fact Sheet

A new publication from the Allen-Sherman-Hoff Company describes construction and application of Ashcolite pipe and couplings for pneumatic and hydraulic materials handling systems.

Advantages of the sand-spun pipe are explained, and one section of the bulletin is devoted to coupling construction and to selection of proper couplings for particular applications. The data sheet uses line drawings, diagrams, schematics and dimension tables to illustrate assembly, methods of determining pipe and coupling sizes and applications of blind flanges and gaskets.

To get a copy circle **No. E15** on Readers' Service Card, last page this issue.

Rubber Lined Valves

A new condensed bulletin, published by Darling Valve & Manufacturing Company, deals exclusively with the company's hard rubber lined gate and check valves for corrosive services. The bulletin contains tables giving range of sizes available and complete dimensions for both rubber lined gate valves and rubber lined horizontal swing check valves. Also described is Darling's fully revolving double disc parallel seat gate valve principle.

To get a copy circle **No. E16** on Readers' Service Card, last page this issue.

Strip-Chart Recorders

A new bulletin describing the company's line of 6-inch strip-chart recorders for pressure, liquid level, temperature, flow and mechanical motion has been released by The Bristol Company. The bulletin contains installation drawings showing methods of applying the instruments to the different variables, as well as photographs of the various models and their features. Use of the recorder as a receiver for remotely generated signals, either pneumatic or electrical, also is described.

To get a copy circle **No. E17** on Readers' Service Card, last page this issue.

Corrosion Anode Report

Corrosion Services Incorporation has issued a detailed report on anodes required for particular corrosion problems. Based on economic studies of various anode installations, the report presents comparative cost data on sizes and types of anodes used in high resistivity soils; the comparison made to illustrate the most economical size and shape anode to use in soils of various resistivities.

To get a copy circle **No. E18** on Readers' Service Card, last page this issue.

Conduit Valve Booklet

Cutaway drawings covering the principal features of the Darling-McEvoy self-sealing two-way conduit valve are featured in a new bulletin released by the company. The series of drawings show how automatic self sealing is accomplished to assure positive closure in either direction of flow. Features and principles of the valve, which has been tested extensively in field pipe line service, also are described.

To get a copy circle **No. E19** on Readers' Service Card, last page this issue.

DUE TO INEFFICIENT PIPELINE PATROL?

With 11 years experience — during which we've flown over 8,000,000 miles, we can give you a more efficient and dependable pipe line patrol at less expense.

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ANY PRESSURE — ANY TEMPERATURE

SKINNER-SEAL EMERGENCY PIPE CLAMP for pinhole or corrosion leaks.

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